EMS

Provincial

Ambulance

Medications

In spring of 2023, the Saskatchewan Health Authority, Medical Oversight Team, which consists of the EMS Provincial Medical Director, Advisors along with the EMS Clinical Care, Quality Assurance and Education Division, in consultation with the SHA Pharmacy, finalized the provincial ground EMS approved medications. Throughout this process, consultation with the Saskatchewan College of Paramedics (SCoP) occurred and was fully supported. ***These medications are to be used in association with the SCoP Paramedic Clinical Practice Protocols.*** All medications will be reviewed biannually and/or updated when changes are required.

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Background

The need for standardization of medications for ground EMS was driven by a number of underlying requirements:

- SHA EMS Accreditation: A high priority Required Organizational Practice for EMS accreditation through Accreditation Canada is to have a consistent medication management for ground EMS including the standardized ordering of high alert medications. This new process and resulting work standard will address the standard ordering of all medications that fall within the Saskatchewan Paramedic Clinical Practice Protocols.
- The ask from paramedics and ambulance services for greater standardization for both contracted and SHA EMS services
- The request from SHA Pharmacy to have a standard drug inventory or standard list of medications for EMS
- To support frontline EMS with a resource that is kept up to date while aligning with best practice based on medical evidence research

The Drug Reference Cards (DRC) for ground EMS were built directly from the SHA formulary. Information on the DRC's came directly from the SHA Parenteral Manual and when required, adjusted dosages for prehospital medicine based on best practice and medical evidence research. All medications within the approved drug classifications were assessed and evaluated by the SHA Medical Oversight Team that include our provincial EMS Clinical Care EMS Medical Director and EMS Medical Advisors. Through this process, there has been consistent collaboration with both SHA Pharmacy and the Saskatchewan College of Paramedics. The standardized order forms for medications were developed based on patient safety/cost saving and the provision of the best dating on the medication with SHA Pharmacy.

We would like to reiterate that this document is a living document, therefore changes will occur. The intent is to ensure it will be updated when required for scope of practice changes and to have biannual reviews to assess and address any changes required, such as a change in best practice, or a change in supplies to medications.

Instructions - How to utilize the Drug Reference Cards

1. The Drug Reference Cards (DRC) are resources that are to be used in association with the Saskatchewan College of Paramedics, "Paramedic Clinical Practice Protocols". It is the expectation that every practitioner understands and practices within their scope of practice.

2. This document can be saved and downloaded for both iPhone and android. Within the **"Table of Contents"**, you can go directly to the medication by selecting that line and it will bring you directly to that medication.

3. Within the **"Indications"** section of the DRC, the **"EMS Indications"** have the SCoP approved scope of practice indications listed. Each licensure level will still need to understand and know what falls under their scope. Within this section, we have also included other Health Canada Approved and Non Health Canada approved uses of each medication as a reference and source of additional information. These are in place to ensure practitioners understand the full use of the medication, as there may be circumstances where it would be beneficial to know, such as an IFT that may be using it for other approved usages. These are for your information only and not to be used to exceed your approved scope of practice.

    a. If a medication has been approved for palliative patient care, it has been noted in the DRC. This specific indication requires palliative approved training.

4. If any medication has an alert associated with it (ex: ELDER ALERT), it has been added to the DRC. These alerts are noted in the **"Cautions"** sections of the DRC.

5. Dosages for prehospital medicine are based on best practice and medical evidence research. Under the **"Dosing"** section, the approved dose, supply and concentration are listed. Within the section, the **"Provider/Route"** identifies all approved routes for each license level.

    a. Pediatrics - when applicable, the pediatric dosages have been added. Please continue to cross reference dosing with approved sources such as Broselow Tape and Pedi STAT for specific weight based dosing.

6. Compatibility/Stability with IV solutions – all medication are considered stable in D5W or NS for at least 24 hours at room temperature ; Compatible with dextrose, saline, dextrose-saline combinations, Ringer's and lactated Ringer's solutions unless otherwise stated on the DRC.

Updates and Highlights - July 2023

The following information is to help address/highlight commonly asked questions regarding the Provincial EMS Ground Medications and to address changes to the new Drug Reference Cards:

Drug Reference Cards (DRC):

- **NEW**
  - All DRC's include "EMS Indications" under the "Indications" section.
  - Clarification with dosing and routes
  - Page numbers have been included in the footers

SIVP defined as:

- Direct IV administration over 2 to 5 minutes

NSAIDS:

- Naproxen is the NSAID of choice. It is to be given PO
- If unable to tolerate PO, IM/IV Ketorolac is available
- Ibuprofen PO is available for patients less than 50 kg

Education modules on potential new medications for you service, provided on SHA MyConnection:

- Epi push dose presser
- Dexamethasone
- Hydromorphone (*for Palliative **only***)
- Nor-Epinephrine
- Ketorolac
- Naproxen

Activated Charcoal:

- Currently the pediatric charcoal 25g/112.5 mL has not gone through formulary alignment, if approved, we will assess adding to the SHA EMS Medication order forms

Antiemetic:

- Ondansetron is the medication of choice.

Acetaminophen/Tylenol:

- Adult dosing updated to 975mg to reflect best practice
- Suppository added

Acetylsalicylic Acid / ASA:

- Medical Director/Advisors in consultation with Cardio Science updated the dose to 160mg

DexAMETHason:

- For pediatrics only

DimenhyDRINATE/Gravol:

- Gravol is ***not*** to be used as a first choice antiemetic. Ondansetron is the first choice for all patients with N/V. Gravol is **not** to be used for elderly patients with N/V, see notation below. It is still the first choice for tx of vertigo and elderly still can be treated with it for vertigo at a reduced dose

DOPamine:

- Removed as a vasopressor carried in the ambulance to reflect best practice and the availability of EPINEPHrine and norepinephrine.
- Remains in your scope of practice and may still be monitored as an inter-facility medication

EPINEPHrine autoinjector:

- Services with EMR can order from alternate source for EMR use only. PCP/ICP/ACP will use EPINEPHrine ampoules. Currently not within SHA Formulary; will continue to follow re: SHA Formulary

Furosemide/Lasix:

- Furosemide/Lasix is not to be used in emergent / acute prehospital medicine. As medicine has progressed and changed through the years, it is no longer best practise to initiate prehospital. A resource drug reference card has been supplied in the interfaculty medication document.

LORazepam IV:

- Removed as a benzodiazepine carried in the ambulance primarily due to its 90-day shelf life and the availability and effectiveness of midazolam.
- Remains in your scope of practice and may still be monitored as an inter-facility medication

Naproxen/Aleve:

- Added to the provincial medication list based on best practice. Naproxen should be used as your primary NSAID for pain (in patients 12 yrs and older), unless your patient cannot tolerate PO medications, then Ketorolac is the medication of choice

Norepinephrine/Levophed:

- Adult dosing updated to reflect best practice, use this dosing rather than ACLS recommendations.

Ondansetron/Zofran:

- If your SHA Pharmacy offers oral dissolvable tablets, you can continue to order and use. It is our understanding that as the Pharmacy Dept. continues their formulary standardization project it will be discontinued, it will be reassessed as their project continues.
- Elderly Alert – update - 65 years or older - Give via intermittent infusion – dilute in 50 mL minibag; may infuse over 20 minutes q 6 hours – this has been confirmed with the SCoP as a medication that is approved for PCP's to initiate via the IV route.

Oxytocin/Syntocinon:

- Medical Director/Advisors in consultation with Obstetrics updated the dosing.

Push Dose EPI

- Medical Director/Advisors have identified EPINEPHrine as the push dose presser (best practice), not norepinephrine.
- If you are using norepinephrine as a push dose presser, please discontinue this practice.

Penthrox:

- SHA Pharmacy will not be adding Penthrox to the SHA formulary
- Currently under assessment
- If your service already has access, continue to access for patient use

Acetaminophen/Tylenol

Classification

- Analgesic, Anti-Pyretic

Indications

EMS INDICATIONS

- Severe sepsis/septic shock adult
- Pyrexic child/adult
- Pain control

HEALTH CANADA APPROVED

- *Severe sepsis/septic shock adult*
- *Pyrexic child/adult*
- *Pain control*

Mechanism of Action

- Pyrexic – direct effect on the heat centres of the hypothalamus, causing heat dissipation and vasodilation
- Analgesic – inhibits prostaglandin synthesis

Pharmacokinetics

- **Onset:** less than 1hr
- **Peak:** 10-60mins
- **Duration:** 4-6hrs
- **Half-life:** 1 to 4 hours
- **Absorbed** through the GI tract, **metabolized** by the liver and **excreted** through the kidneys

Contraindications

- Hypersensitivity to Acetaminophen
- Acetaminophen – induced liver disease

Cautions

- Acetaminophen can potentiate effects of Warfarin

Adverse Effects

DERMATOLOGIC:

- Erythema of skin, skin blister, skin rash

OTIC:

- Hearing loss

Dosing

ADULT/ELDERLY

- **Oral:** 325 - 975 mg every 4 to 6 hours, do not exceed 4000 mg/24 hours
- **Rectal:** 325 to 650 mg 4 to 6 hours, do not exceed 3900 mg/ 24 hours

PEDIATRIC

- **Oral/Rectal:** 10mg - 15 mg/kg every 4 to 6 hours (max 4 g per 24hr)

Concentration Supplied

Adult:

- 325 mg tablet

Pediatric:

Infant:

- 80 mg/1mL (up to 2 years)

Child:

- 160 mg/5mL

Suppository:

- 120 mg or 325 mg

Route:

- **EMR:** PO
- **PCP/ICP:** PO/PR
- **ACP/CCP:** PO/PR

Resources:

- SHA EMS Medical Director & Advisors
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6264?cesid=1RSybwprskA&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dacetaminophen%26t%3Dname%26acs%3Dtrue%26acq%3DACE

Development – May 2023
Update – July 27, 2023

Acetylsalicylic Acid
ASA/Aspirin/Entrofen/Novasen

Classification

- Analgesic
- Anti-Platelet
- Anti-Inflammatory

Indications

EMS INDICATIONS

- EMR - assist patient with medication
- Ischemic chest pain
- Given in addition to if they have already taken their prescribed dose
- Given in addition to if they are currently taking blood thinners

HEALTH CANADA APPROVED

- *Ischemic chest pain*
- *Valvular heart disease*
- *Carotid endarterectomy*
- *Atherosclerotic cardiovascular disease*
- *Anti-inflammatory for arthritis associated with rheumatic disease*
- *Analgesic/Antipyretic*
- *Vascular indications, including ischemic stroke, transient ischemic attack, acute coronary syndromes (ST-elevation myocardial infarction or non-ST-elevation acute coronary syndromes [non-ST-elevation myocardial infarction or unstable angina]), secondary prevention after acute coronary syndromes, and management of stable ischemic heart disease:*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITERATURE

- *Carotid artery stenting*
- *Colorectal cancer risk reduction, primary prevention*
- *Migraine, acute treatment*
- *Pericarditis, acute or recurrent*
- *Polycythemia vera, prevention of thrombosis*
- *Preeclampsia prevention*
- *Venous thromboembolism prevention, indefinite therapy*
- *Venous thromboembolism prophylaxis for total hip or total knee arthroplasty*
- *Venous thromboembolism prophylaxis in lower-risk patients with multiple myeloma receiving immunomodulatory therapy*

Mechanism of Action

- Irreversibly inhibits cyclooxygenase-1 and 2 (COX-1 and 2) enzymes, via acetylation, which results in decreased formation of prostaglandin precursors
- irreversibly inhibits formation of prostaglandin derivative, thromboxane A_2, via acetylation of platelet cyclooxygenase, thus inhibiting platelet aggregation; has antipyretic, analgesic, and anti-inflammatory properties

Pharmacokinetics

- **Onset:** Chewing nonenteric-coated or enteric-coated tablets results in inhibition of platelet aggregation within 20 minutes
- **Peak:** Chewing nonenteric-coated tablets results in a time to peak concentration of 20 minutes
- **Duration:** 3-6 hrs
- **Half-life:** 15 to 20 minutes
- **Metabolized** through the liver and **excreted** through the kidneys as Urine (75% as salicyluric acid, 10% as salicylic acid)

Contraindications

- Hypersensitivity to ASA or other NSAIDS
- Contraindicated in children under 16 years for viral infections, with or without fever.
- patients with asthma, rhinitis, and nasal polyps

Cautions

- Asthmatics (can precipitate bronchospasm)
- Active bleeding ulcers (risk vs benefit)
- Hepatic insufficiency
- Bleeding disorders
- Pregnancy (risk vs benefit in suspected ischemic chest pain)
- Bariatric surgery
- Dehydration: Use with caution in patients with dehydration.
- Ethanol use: Heavy ethanol use (>3 drinks/day) can increase bleeding risks.
- Renal impairment
- High potassium like abnormal heartbeat, confusion, dizziness, passing out, weakness, shortness of breath, or numbness or tingling feeling
- Acidosis like confusion, fast breathing, fast heartbeat, abnormal heartbeat, severe abdominal pain, nausea, vomiting, fatigue, shortness of breath, or loss of strength and energy
- Weakness on 1 side of the body, trouble speaking or thinking, change in balance, drooping on one side of the face, or blurred eyesight
- Severe dizziness
- Passing out
- Severe headache
- Noise or ringing in the ears
- Trouble hearing
- Agitation
- Seizures
- Severe rectal pain
- Rectal bleeding

DRUG INTERACTIONS

- Thrombolytics: In the treatment of acute ischemic stroke, avoid aspirin for 24 hours following administration of a thrombolytic; administration within 24 hours increases the risk of hemorrhagic transformation.

PREGNANCY/BREASTFEEDING

- Except when used in lower doses for pregnancy-related conditions, maternal use of aspirin should be avoided beginning 20 weeks gestation
- Low-dose aspirin may be used in breastfeeding patients; however, standard doses of aspirin should be avoided

Adverse Effects

CARDIOVASCULAR:
- Cardiac arrhythmia, hypotension, tachycardia

ENDOCRINE & METABOLIC:
- Dehydration, hyperglycemia, hyperkalemia, hypoglycemia (children), increased thirst, metabolic acidosis
- Hyperuricemia (doses ≤325 mg/day)

GASTROINTESTINAL:
- Abdominal pain, dyspepsia, gastrointestinal perforation, gastrointestinal ulcer, heartburn, nausea, vomiting
- Gastrointestinal hemorrhage
- pancreatitis

GENITOURINARY:
- Postpartum hemorrhage, post-term pregnancy, prolonged labor, proteinuria, stillborn infant

HEMATOLOGIC & ONCOLOGIC:
- Disorder of hemostatic components of blood, disseminated intravascular coagulation, hemorrhage, prolonged bleeding time, prolonged prothrombin time, thrombocytopenia

HEPATIC:
- Hepatitis, increased liver enzymes

NERVOUS SYSTEM:
- Agitation, brain edema, coma, confusion, dizziness, headache, hypothermia, lethargy, seizure
- Intracranial hemorrhage, Reye's syndrome

RENAL:
- Increased blood urea nitrogen, increased serum creatinine, interstitial nephritis, renal failure syndrome, renal insufficiency, renal papillary necrosis

RESPIRATORY:
- Hyperventilation, laryngeal edema, pulmonary edema, respiratory alkalosis, tachypnea
- Asthma , bronchospasm

MISCELLANEOUS:
- Fever, low birth weight

DERMATOLOGIC:
- Urticaria

HYPERSENSITIVITY:
- Anaphylaxis, angioedema

IMMUNOLOGIC:
- Drug reaction with eosinophilia and systemic symptoms

NEUROMUSCULAR & SKELETAL:
- Rhabdomyolysis

OPHTHALMIC:
- Macular degeneration

OTIC:
- Hearing loss, tinnitus

Dosing

ADULT/ELDERLY

- 160 mg, uncoated **chewed and swallowed**

Concentration Supplied:

- 80 mg chewable tablet

Route:

- **EMR:** chew and swallow
- **PCP/ICP:** chew and swallow
- **ACP/CCP:** chew and swallow

Resources:

- SHA EMS Medical Director & Advisors
- ACLS for Experienced Providers 2017
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6388?cesid=aJm4GiQ0sOO&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dasa%26t%3Dname%26acs%3Dfalse%26acq%3Dasa
- https://web.p.ebscohost.com/nup/detail/detail?vid=10&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009958716&db=nup

Development – May 2023
Update - July 31, 2023

Charcoal, Activated

Classification

- Antacids and adsorbents
- Antidote

Indications

EMS INDICATIONS

- Used in treatment of most oral poisonings except those caused by corrosive agents (e.g. strong acid or alkalis) or substances for which its absorptive capacity is too low to be clinically useful (e.g. iron salts, lithium, etc)

HEALTH CANADA APPROVED

- *Used in treatment of most oral poisonings except those caused by corrosive agents (e.g. strong acid or alkalis) or substances for which its absorptive capacity is too low to be clinically useful (e.g. iron salts, lithium, etc)*
- *Most commonly used agent for GI decontamination poisoned patients*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITERATURE

- *Intracranial hemorrhage associated with oral non-vitamin K antagonist anticoagulants*

Mechanism of Action

- Adsorbs toxic substances, thus inhibiting GI absorption and preventing or limiting systemic toxicity. Administration of multiple doses of charcoal may interrupt enteroenteric, enterohepatic, and enterogastric circulation of some drugs; may also adsorb any unabsorbed drug which remains in the gastrointestinal tract.

Pharmacokinetics

- **Onset:** within mins
- **Duration:** 4-12hrs
- **Peak:** unknown
- Most effective when administered early, preferably within 30-60 minutes of poison ingestion
- **Excreted** in feces as charcoal

Contraindications

- Before endoscopy and ingestion of corrosive agents, unless necessary to adsorb another ingested toxin; may obscure endoscopic evaluation of gastroesophageal lesion
- Patients with an unprotected airway, a GI tract that is not anatomically intact, and where risk or severity of aspiration may be increased (e.g. hydrocarbon ingestions)
- Multiple-dose regimen in presence of ileus or bowel obstruction

Cautions

- Not effective in the treatment of poisoning due to ingestion of low molecular weight compounds such as cyanide, iron, ethanol, methanol or lithium.
- Most effective when administered within 30 to 60 minutes of ingestion**.**
- Vomiting
- Decreased peristalsis
- Peds: Excessive amounts of activated charcoal with sorbitol may cause hypernatremic dehydration in pediatric patients
- use is not recommended in infants less than 1 year of age.

DRUG INTERACTIONS

- Cathartics (eg, sorbitol, mannitol, magnesium sulfate)

PREGNANCY/BREASTFEEDING

- No Concerns

Adverse Effects

OPHTHALMIC: Corneal abrasion (with direct contact)

GASTROINTESTINAL

- Nausea, vomiting
- Constipation
- Diarrhea
- GI obstruction or fecal impaction in dehydrated patients
- Abdominal distention, appendicitis, constipation, dental discoloration (black; temporary), fecal discoloration (black), intestinal obstruction, mouth discoloration (black; temporary)

PULMONARY

- Aspiration resulting in bronchiolitis obliterans, tissue reaction to suspension agents, and increased lung permeability (rare)
- Respiratory failure

Dosing

Contact PADIS for treatment recommendations

ADULT/ELDERLY

- 50 grams **PO**

PEDIATRIC

- Contact PADIS

Concentration Supplied:

- 50 g/250 ml

Route:

- **EMR:** oral
- **PCP/ICP:** oral
- **ACP/CCP:** oral

Resources:

- SHA EMS Medical Director & Advisors
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6579?cesid=2psQmMuHzw3&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dactivated%2Bcharcoal%26t%3Dname%26acs%3Dtrue%26acq%3Dactivate
- SaskKids Pediatric Parental Manual

Development – May 2023
Update - July 31, 2023

Adenosine

Classification

- Antiarrhythmic

Indications

EMS INDICATIONS

- For the conversion of paroxysmal supraventricular tachycardia to sinus rhythm, including that associated with accessory bypass tracts (Wolff-Parkinson-White Syndrome). Adenosine does not convert atrial flutter, atrial fibrillation or ventricular tachycardia to normal sinus rhythm
- As a diagnostic tool in patients with broad or narrow QRS complex supraventricular tachycardia

HEALTH CANADA APPROVED

- *For the conversion of paroxysmal supraventricular tachycardia to sinus rhythm, including that associated with accessory bypass tracts (Wolff-Parkinson-White Syndrome). Adenosine does not convert atrial flutter, atrial fibrillation or ventricular tachycardia to normal sinus rhythm*
- *As a diagnostic tool in patients with broad or narrow QRS complex supraventricular tachycardi*a
- *Pharmacologic cardiac stress testing, diagnostic aid*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *For induction of maximal coronary hyperemia as a diagnostic agent in determining the severity of coronary stenosis*

Mechanism of Action

- Slows conduction time through the AV node, interrupting the re-entry pathways through the AV node, restoring normal sinus rhythm
- **Myocardial perfusion scintigraphy:** Adenosine also causes coronary vasodilation and increases blood flow in normal coronary arteries with little to no increase in stenotic coronary arteries; thallium-201 uptake into the stenotic coronary arteries will be less than that of normal coronary arteries revealing areas of insufficient blood flow.

Pharmacokinetics

- **Onset:** Immediate
- **Peak:** unknown
- **Duration:** 1-2mins
- **Half life:** less than 10 seconds
- **Metabolized** from systemic circulation primarily by vascular endothelial cells and erythrocytes (by cellular uptake); rapidly metabolized intracellularly.

Contraindications

- Known hypersensitivity to adenosine or any component of formulation
- Second or third degree AV block (except in patients with artificial pacemaker)
- Sick sinus syndrome (except in patients with functioning artificial pacemaker)
- Symptomatic bradycardia (except in patients with a functioning artificial pacemaker)

Cautions

- **HIGH ALERT, ELDER ALERT**
- ELDERLY: may have diminished cardiac function, nodal dysfunction, concomitant disease, or drug therapy that may alter haemodynamic function and produce severe bradycardia or AV block.
- May produce (short lasting) first, second or third degree heart block. Transient asystole may occur, external pacer should be easily accessible
- Patients with asthma, COPD or a history suggestive of bronchospasm; may cause bronchospasm
- A variety of new rhythms may occur at the time of conversion to normal sinus rhythm
- Patients with atrial fibrillation/flutter and an accessory bypass tract may develop increased conduction down the anomalous pathway
- Central line administration: lower doses should be considered due to decreased degradation by vascular endothelium and blood cells
- Heart transplant patients: clinically profound bradycardia can result. Use greatly decreased doses if at all
- Wolff-Parkinson-White (WPW) syndrome: Adenosine should not be used in patients with WPW syndrome and preexcited atrial fibrillation/flutter since ventricular fibrillation may result
- Arrhythmia (wide-complex tachycardia): Avoid use in irregular or polymorphic wide-complex tachycardias; may cause degeneration to ventricular fibrillation

DRUG INTERACTIONS

- digoxin or digoxin/verapamil combination: has caused ventricular fibrillation, use with caution
- carBAMazepine – higher degree of heart block may be produced
- dipyridamole – effects of adenosine potentiated. Dose reduction is advised
- Methylxanthines (caffeine, theophylline) – effects of adenosine are antagonized. May require higher doses

PREGNANCY/BREASTFEEDING

- No concerns in pregnancy but advised to interrupt nursing.

MONITORING REQUIRED

- ECG, heart rate, blood pressure
- Continuous ECG monitoring during infusion and for 3 to 5 minutes after administration and then until stable

PEDIATRIC/NEONATE

- Defibrillator and personnel competent with procedures requiring such equipment are required at bedside for the safe administration of adenosine
- Monitor ECG, heart rate, blood pressure, respirations during and for 3 to 5 minutes after administration and then until stable

Adverse Effects

Reactions appear immediately after administration and usually last less than one minute

CARDIOVASCULAR

- Facial flushing (common)
- Angina-like chest pain/pressure (common)
- Sweating
- Palpitations
- Headache
- Arrhythmias at time of conversion to normal sinus rhythm: premature ventricular contractions, polymorphic ventricular tachycardia, torsades de pointes, atrial premature contractions, sinus bradycardia, sinus tachycardia, skipped beats, varying degrees of A-V nodal block
- Hypotension (rare)
- Prolonged asystole

RESPIRATORY

- Shortness of breath/dyspnea (common)
- Hyperventilation
- Bronchospasm

CENTRAL NERVOUS SYSTEM

- Light headedness/dizziness
- Tingling and/or heaviness in the arms
- Numbness
- Blurred vision
- Burning sensation
- Neck and back pain

GASTROINTESTINAL

- Nausea (common)
- Metallic taste
- Tightness in throat

Dosing

ADULT:
1st dose – 6mg **RIVP** with rapid 20ml flush
2nd dose- 12mg **RIVP** with rapid 20ml flush

PEDIATRICS:
1st dose – 0.1mg/kg **RIVP** (max 6mg)
2nd dose – 0.2mg/kg **RIVP** (max 12mg)

Concentration Supplied:
- 3mg/ml (2ml vial)

Route:
- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO

Resources:
- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/adenosine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6288?cesid=1wkT42n9Lee&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dadenosine%26t%3Dname%26acs%3Dtrue%26acq%3Dadenos
- https://web.p.ebscohost.com/nup/detail/detail?vid=14&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535799&db=nup

Development – May 08, 2023
Update – July 31, 2023

Amiodarone HIGH ALERT

Classification

- Antiarrhythmic

Indications

EMS INDICATIONS

- Life-threatening recurring ventricular fibrillation (VFib) and hemodynamically unstable ventricular tachycardia (VT)
- Antiarrhythmic during Advanced Cardiac Life Support (VFib/pulseless VT and stable VT)

HEALTH CANADA APPROVED

- *Life-threatening recurring ventricular fibrillation (VFib) and hemodynamically unstable ventricular tachycardia (VT)*

NON HEALTH CANANDA APPROVED BUT SUBSTANTIATED IN THE LITERATURE

- *Antiarrhythmic during Advanced Cardiac Life Support (VFib/pulseless VT and stable VT)*
- *Atrial arrhythmias: restoration and maintenance of sinus rhythm, or rate control, in patients with atrial arrhythmias in whom standard therapies were unsuccessful or contraindicated*

Mechanism of Action

- Class III antiarrhythmic agent which inhibits adrenergic stimulation (alpha- and beta-blocking properties), affects sodium, potassium, and calcium channels, prolongs the action potential and refractory period in myocardial tissue; decreases AV conduction and sinus node function.

Pharmacokinetics

- **Onset:** 2 hours
- **Peak:** less than 30 – 45 minutes post infusion
- **Duration:** unknown
- **Half-life**: 9 - 36days
- **Metabolized** primarily by hepatic metabolism and biliary **excretion** as Feces; urine (less than 1% as unchanged drug).

Contraindications

- Hypersensitivity to amiodarone, iodine or any component of the formulation
- Marked sinus bradycardia, cardiogenic shock, 2nd or 3rd degree AV block in the absence of a pacemaker

Cautions

- **HIGH ALERT**
- Thyroid dysfunction, pulmonary interstitial abnormalities; as oral amiodarone is contraindicated
- Hypotension and severe respiratory failure
- Electrolyte imbalance: especially hypokalemia or hypomagnesemia, correct prior to use and throughout therapy
- Wolff-Parkinson-White (WPW) syndrome: Amiodarone should not be used in patients with WPW syndrome and preexcited atrial fibrillation/flutter since ventricular fibrillation may result

DRUG INTERACTIONS

- Drugs metabolized by CYP enzymes: is a potent inhibitor of CYP enzymes and transport proteins (including p-glycoprotein), which may lead to increased serum concentrations/toxicity of a number of medications
- Drugs with QT prolongation potential: particular caution must be used when a drug with QTc-prolonging potential relies on metabolism via enzymes amiodarone inhibits, since the effect of elevated concentrations may be additive with the effect of amiodarone. Carefully assess risk: benefit of co-administration of other drugs which may prolong QTc interval
- Warfarin: risk of increased INR with or without bleeding; monitor INR closely after initiating amiodarone

PREGNANCY/BREASTFEEDING

- Oral or IV amiodarone should be used in pregnancy only to treat arrhythmias refractory to other treatments or when other treatments are contraindicated.
- The manufacturer does not recommend breastfeeding during therapy.

REQUIREMENTS

- Non-PVC, non-DEHP container for infusion duration longer than 2 hours
- Electronic infusion device. In-line filter (0.2/ 0.22 micron) for intermittent and continuous infusions
- Pediatrics less than 6 kg: Non-PVC, non-DEHP tubing and in-line filter for continuous infusion
- Central line required for infusion durations longer than 1 hour with concentrations greater than 2 mg/mL

MONITORING REQUIRED

DIRECT IV - CARDIAC ARREST:

- HR and ECG monitoring as per cardiac arrest team leader

INTERMITTENT AND CONTINUOUS INFUSION:

- Continuous ECG monitoring. Notify physician if bradycardia and/or marked QTc prolongation occur
- Baseline BP and HR then q 15 minutes x 4 and until stable, for continuous infusion continue q4h during infusion
- Monitor peripheral IV site for pain, redness or swelling prior to initiating infusion and q4h during infusion

RECOMMENDED

- Serum electrolytes and acid-base balance, especially in patients with prolonged diarrhea and those receiving diuretics
- Liver enzymes (AST, ALT, GGT) for elevations indicating progressive injury
- Pulmonary function tests including chest X-rays, serum creatinine and thyroid function tests may be indicated

Adverse Effects

CARDIOVASCULAR

- Clinically significant hypotension. Usually occurs within the first several hours or with daily doses greater than
- 2.1 grams Responds to reduction of infusion rate. May require IV fluids, vasopressors or positive inotropic agents
- Bradycardia. Responds to slowing or temporarily stopping infusion. May require pacing
- Proarrhythmic effect, both bradyarrhythmias and tachyarrhythmias. The most clinically relevant is torsade de pointes, which is often preceded by bradycardia and marked QTc prolongation

EXTRAVASATION

- Irritant: venous thrombosis, irritation and potential tissue necrosis with extravasation at IV site and surrounding infiltrated area, especially with a concentration of 3 mg/mL or greater
- Treatment: Discontinue drug immediately and notify physician. Apply cold intermittent compresses. See Regional Intravenous Therapy Practice and Clinical Standards - Extravasation. No information on an available 'antidote' at this time

MISCELLANEOUS

- Early and moderate increase in transaminase levels
- Pulmonary edema, nausea, fever
- Hepatotoxicity
- Pulmonary toxicity
- Thyroid effects

Dosing

ADULT:

VF/Pulseless VT:

- 300mg **IVP bolus** (repeat 150mg q 5min)

VT w/pulse:

- 150mg in 100ml NaCL **infused IV via pump** over 10 minutes

Maintenance Infusion:

- 1mg/min = 450mg in 250ml D5W @ 33ml/hr **IV infusion on pump** (max 2.2g in 24hrs)

PEDIATRIC:

VF/Pulseless VT:

- 5mg/kg **IVP bolus** (max 300mg), repeat to daily max dose 15mg/kg (2.2g in adolescents)

VT w/pulse:

- 5mg/kg (max 300mg) in 250ml D5W over 60 min **IV infusion on pump**

Concentration Supplied:

- 50 mg/ml (3ml vial)

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO, CVAD, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/amiodarone.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6332?cesid=08bHheqOwRX&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Damiodarone%26t%3Dname%26acs%3Dtrue%26acq%3Damiod
- SaskKids Pediatric Parental Manual
- https://web.p.ebscohost.com/nup/detail/detail?vid=20&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535331&db=nup

Development – May, 2023
Update – July 31, 2023

Atropine ELDER ALERT

Classification

- Anticholinergic

Indications

EMS INDICATIONS

- Symptomatic Bradycardia
- Antidote for organo-phosphate poisoning
- Reverse cardiac effects (decreased heart rate, blood pressure and systemic vascular resistance) associated with increased vagal tone

HEALTH CANADA APPROVED

- *Antidote for organo-phosphate, muscarine and other anticholinesterase poisoning*
- *Preoperatively as an antisialogogue to reduce salivation and excessive respiratory secretions. Atropine is not needed as commonly with newer anesthetic agents*
- *Prevent cholinergic effects which result from vagal stimulation during surgery (eg, bradycardia, hypotension, cardiac arrhythmias)*
- *Reverse cardiac effects (decreased heart rate, blood pressure and systemic vascular resistance) associated with increased vagal tone*
- *In combination with anticholinesterase agents (eg, neostigmine) after surgery to terminate curarization*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUSTANTIATED IN LITURATURE

- *Stress echocardiography (adjunctive agent) (diagnostic agent)*

Mechanism of Action

- Blocks the action of acetylcholine at parasympathetic sites in smooth muscle, secretory glands, and the CNS; increases cardiac output, dries secretions. Atropine reverses the muscarinic effects of cholinergic poisoning due to agents with acetylcholinesterase inhibitor activity by acting as a competitive antagonist of acetylcholine at muscarinic receptors. The primary goal in cholinergic poisonings is reversal of bronchorrhea and bronchoconstriction. Atropine has no effect on the nicotinic receptors responsible for muscle weakness, fasciculations, and paralysis; concurrent administration of pralidoxime is necessary to reverse the nicotinic effects associated with organophosphate insecticide or nerve agent toxicity.

Pharmacokinetics

- **Onset:** Immediate
- **Peak:** 2-4 minutes
- **Duration:** 4-6hrs
- **Metabolized** through the Hepatic system via enzymatic hydrolysis
- **Excretion:** Excretion: Urine (13% to 50% as unchanged drug and metabolites)

Contraindications

- Hypersensitivity to atropine, or any component of formulation. No contraindications exist in treatment of severe or life threatening muscarinic effects, including life-threatening poisoning
- Narrow-angle glaucoma
- myasthenia gravis
- Unstable cardiovascular status in acute hemorrhage
- Severe ulcerative colitis, toxic megacolon complicating ulcerative colitis

Cautions

- **ELDER ALERT**
- Elderly: may produce excitement, agitation, confusion or drowsiness. May precipitate undiagnosed glaucoma; potential for constipation and urinary retention increased; has potential to increase memory impairment
- Hepatic and renal disease, ulcerative colitis, hyperthyroidism, autonomic neuropathy
- Coronary heart disease, heart failure, cardiac arrhythmias, tachycardia and hypertension
- Prostatic hypertrophy, hiatus hernia associated with reflex esophagitis
- Heart transplant recipients: Atropine will likely be ineffective in treatment of bradycardia due to lack of vagal innervation of the transplanted heart. Cholinergic reinnervation may occur over time (years), so atropine may be used cautiously; however, some may experience paradoxical slowing of the heart rate and high-degree AV block upon administration

REQUIREMENTS

- Flush with NS after each dose
- Heart rate, blood pressure, pulse, mental status; intravenous administration requires a cardiac monitor

MONITORING REQUIRED

- Baseline BP and heart rate, then every 3 minutes x 2, and until stable – EXCEPTION: cardiac arrest
- Continuous ECG monitoring while giving dose and until stable

RECOMMENDED

- Bowel sounds and urine output if ordered for longer than 24 hours

Adverse Effects

CARDIOVASCULAR

- Tachycardia
- Palpitations/Arrhythmias
- Bradycardia in adults at doses less than 0.5 mg or if given slowly (more than 2 minutes) Controversial if this is a concern in pediatrics
- Heart block
- Hypertension
- Increased myocardial ischemia and angina

CENTRAL NERVOUS SYSTEM

- Mild dizziness
- Disorientation/ confusion – especially in elderly or debilitated patients
- Excitement/agitation
- Drowsiness

GASTROINTESTINAL

- Dry mouth
- Constipation

GENITOURINARY

- Urinary retention

MISCELLANEOUS

- Flushing, dry skin, increase in body temperature – especially in children and brain-damaged infants
- Blurred vision
- Photophobia

Dosing

*Slow IV administration may cause Paradoxical bradycardia

Bradycardia:

- Adult - 1mg **IVP** q 3 – 5 min (max 3mg)
- Peds – 0.02mg/kg **IVP** (max singe dose 0.5mg) q 3- 5 minutes

OPP:

- Adult - 2 to 5mg **IVP** q 10 - 15 min
- Peds - 0.05mg/kg **IVP** q 10-15 min

Concentration Supplied:

- 0.2mg/ml (5ml preload)

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP**: IV, IO, CVAD, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/atropine.pdf
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/5699355?cesid=1xSqaJB82Qg&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Datropine%26t%3Dname%26acs%3Dtrue%26acq%3Datrop
- https://web.p.ebscohost.com/nup/detail/detail?vid=18&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535703&db=nup

Development – May, 2023
Update – July 31, 2023

Calcium Chloride HIGH ALERT

Classification

- Electrolyte

Indications

EMS INDICATIONS

- Treatment of hypocalcemia for those conditions requiring a prompt increase in serum calcium concentrations e.g. cardiac arrest or cardiotoxicity in the presence of evidence of hyperkalemia
- Treatment of sine wave pattern ECG

HEALTH CANADA APPROVED

- *Treatment of hypocalcemia for those conditions requiring a prompt increase in serum calcium concentrations e.g. cardiac arrest or cardiotoxicity in the presence of hyperkalemia, hypocalcemia, or hypermagnesemia*
- *Prevention of hypocalcemia during exchange transfusions of citrated blood*
- *Tetany*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN THE LITERATURE

- *Calcium channel blocker overdose; beta-blocker overdose. Contact Poison and Drug Information Service 1-866-454-1212 for the latest recommendations*

Mechanism of Action

- Moderates nerve and muscle performance via action potential excitation threshold regulation.

Pharmacokinetics

- **Onset:** Immediate
- **Peak:** Immediate
- **Duration:** 0.5-2hrs
- **Excretion:** Excretion: Primarily feces (80% as insoluble calcium salts); urine (20%)

Contraindications

- Hypersensitivity to calcium chloride or any component of the formulation
- Hypercalcemia; severe renal disease; calcium loss due to immobilization

Cautions

- HIGH ALERT
- **For IV use only**; not to be administered IM, subcutaneously: results in severe tissue necrosis
- Acidosis: patients with respiratory acidosis, renal impairment, or respiratory failure; acidifying effect of calcium chloride may potentiate acidosis

- Severe hyperphosphatemia: elevated levels of phosphorus and calcium may result in soft tissue and pulmonary arterial calcium-phosphate precipitation
- Severe hypokalemia: acute rises in serum calcium levels may result in life-threatening cardiac arrhythmias
- Hypomagnesemia: is a common cause of hypocalcemia; therefore, correction of hypocalcemia may be difficult in patients with concomitant hypomagnesemia. Evaluate serum magnesium and correct hypomagnesemia (if necessary), particularly if initial treatment of hypocalcemia is refractory

DRUG INTERACTIONS

- cefTRIAXone may complex with calcium causing precipitation. See cefTRIAXone monograph for specific details
- digoxin: may increase risk of arrhythmias. ECG monitoring is recommended

REQUIREMENTS

- Electronic infusion device for intermittent and continuous infusions.
- Central line preferred Central line for concentrations of 40 mg/mL or greater: exception – life threatening situation

PEDIATRICS

- Consult Critical Care or Transport Team

MONITORING REQUIRED

- ECG monitoring for direct IV administration or rates greater than 50 mg/minute
- Monitor peripheral IV site for pain, redness or swelling prior to initiating infusion and every 15 minutes until completion of infusion

RECOMMENDED

- Advise patients to report burning/stinging/pain at IV site promptly. Calcium chloride 100 mg/mL = 2040 mOsm/L
- Additional doses guided by serum calcium and albumin levels

Adverse Effects

CARDIOVASCULAR

- Peripheral vasodilation with moderate decrease in BP
- Bradycardia, cardiac arrhythmias, syncope and cardiac arrest - associated with too rapid rate of injection

MISCELLANEOUS

- Local burning sensation: further dilution and decrease rate of administration may be required
- Tingling sensations
- Sense of oppression or heat waves
- Calcium or chalky taste

EXTRAVASATION

- Irritant: may cause severe necrosis and calcification at IV site and surrounding infiltrated area

TREATMENT:

- discontinue drug immediately and notify physician

Dosing

Adult:

- 20mg/kg (max 1g) **SIVP** over 2-5 minutes. Repeat in 5 minutes if no ECG changes

Concentration Supplied:

- 100mg/ml (10ml Preload)

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/calcium%20chloride.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6505?cesid=7MbBmlAb1mW&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dcalcium%2Bchloride%26t%3Dname%26acs%3Dtrue%26acq%3Dcalci
- https://web.p.ebscohost.com/nup/detail/detail?vid=22&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009958743&db=nup

Development – May, 2023
Update – July 31, 2023

CefTRIAXone Allergy Alert

Classification

- 3rd generation cephalosporin antibiotic

Indications

EMS INDICATIONS

- Treatment of infections of the lower respiratory and urinary tract, skin structure and bone: also peritonitis, septicemia and meningitis when caused by susceptible organisms. Only to be administered where there is greater than 45min delay to administration of antibiotic in hospital.
- Can be administered while on OFFLOAD DELAY if greater than 45mins and patient meets EMS indications.

HEALTH CANADA APPROVED

- *Treatment of infections of the lower respiratory and urinary tract, skin structure and bone: also peritonitis, septicemia and meningitis when caused by susceptible organisms. Only to be administered where there is greater than 45min delay to administration of antibiotic in hospital.*
- *Perioperative prophylaxis*

Mechanism of Action

- Inhibits bacterial cell wall synthesis by binding to one or more of the penicillin-binding proteins (PBPs) which in turn inhibits the final transpeptidation step of peptidoglycan synthesis in bacterial cell walls, thus inhibiting cell wall biosynthesis. Bacteria eventually lyse due to ongoing activity of cell wall autolytic enzymes while cell wall assembly is arrested.

Pharmacokinetics

- **Onset:** Rapid
- **Peak:** End of infusion
- **Duration:** 12-24hrs
- **Elimination:** Urine (33% to 67% as unchanged drug); feces (as inactive drug)

Contraindications

- Hypersensitivity to cefTRIAXone, any component of formulation or other cephalosporins
- **DO NOT** administer cefTRIAXone simultaneously with IV calcium-containing solutions including continuous infusions (e.g. lactated Ringer's, Hartmann's solution or parenteral nutrition) even via different infusion lines or at different infusion sites
- cefTRIAXone and IV calcium-containing solutions MAY be administered sequentially, provided the lines are thoroughly flushed between infusions with a compatible fluid
- If the use of cefTRIAXone is considered necessary in patients requiring continuous nutrition, the infusion of parenteral nutrition solution could be stopped for the period of cefTRIAXone infusion and the infusion lines flushed between solutions

- Do not use in hyperbilirubinemic neonates. Displaces bilirubin from albumin binding sites resulting in higher free serum bilirubin
- Contraindicated if treatment with calcium-containing IV solutions required/ expected to be required, including continuous calcium-containing infusions such as parenteral nutrition, due to risk of precipitation of cefTRIAXonecalcium
- Cases of fatal reactions with cefTRIAXone-calcium precipitates in the lungs and kidneys of both term and premature neonates have been reported

Cautions

- **ALLERGY ALERT**
- Previous immediate hypersensitivity to penicillin antibiotics. Cross-sensitivity between penicillins and cephalosporins is estimated to be very low. The beta-lactam subunit is not considered primary allergenic determinant; rather, the side chain predicts cross-reactivity. cefTRIAXone does NOT have a structurally related side chain to penicillin, ampicillin or amoxicillin
- Gastrointestinal disease (particularly colitis); may cause pseudomembranous colitis

DRUG INTERACTIONS

- see contraindications

PREGNANCY/BREASTFEEDING

- No concerns

REQUIREMENTS

- Electronic infusion device

MONITORING REQUIRED

- Monitor for hypersensitivity reaction(s)
- Obtain renal and liver function prior to treatment
- Obtain PT/INR in patients at risk for elevations

Adverse Effects

LOCAL REACTIONS

- Pain on injection, thrombophlebitis
- Fatal particulate precipitation of calcium – cefTRIAXone in the lungs and kidneys of both term and premature neonates

HYPERSENSITIVITY

- Anaphylaxis, including bronchospasm and hypotension (rare)
- Urticaria, pruritus, fever, eosinophilia, cytopenia

GASTROINTESTINAL

- Diarrhea
- Nausea/vomiting
- Abdominal pain
- Pseudomembranous colitis (rare)
- “Biliary sludge” or pseudolithiasis (rare)

Dosing

Dose:

- 2g in 50ml NaCl **IV infusion with pump** over 20 minutes OR
- 2g in 10ml NaCl **IVP** over 5 minutes

Concentration Supplied:

- 2g vial (must be reconstituted)

Reconstitution:

- Add 10mls sterile water to 2g vial

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/cefTRIAXone.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6563?cesid=9FPpdDPSimX&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DcefTRIAXone%26t%3Dname%26acs%3Dtrue%26acq%3Dcef
- https://web.p.ebscohost.com/nup/detail/detail?vid=24&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565149&db=nup

Development – May 18, 2023
Update – July 31, 2023

DexAMETHasone ELDER ALERT

Classification

- Corticosteroid

Indications

EMS INDICATIONS

- Pediatric - Adjunctive treatment for anaphylaxis, croup and bronchospasm secondary to asthma.

SHA EMS Medical Direction Note:

- Preferred steroid treatment for pediatric croup.

HEALTH CANADA APPROVED

- *Treatment of conditions responsive to steroid therapy including adrenocortical insufficiency, cerebral edema associated with brain tumours, allergic states and inflammatory diseases; when oral therapy is not feasible*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Prevention and treatment of cancer chemotherapy-induced nausea and vomiting, if unable to give by mouth*
- *Adjunct in the treatment of pediatric bacterial meningitis*
- *Bronchopulmonary dysplasia to facilitate ventilator weaning*

Mechanism of Action

- Dexamethasone is a long-acting corticosteroid with minimal sodium-retaining potential. It decreases inflammation by suppression of neutrophil migration, decreased production of inflammatory mediators, and reversal of increased capillary permeability; suppresses normal immune response. Dexamethasone induces apoptosis in multiple myeloma cells. Dexamethasone's mechanism of antiemetic activity is unknown.

Pharmacokinetics

- **Onset:** Unknown
- **Peak**: 1-2 hours PO
- **Duration:** 72hrs
- **Half-life:** 4hrs
- **Metabolism:** Hepatic
- **Excretion:** Urine (~10%)

Contraindications

- Hypersensitivity to dexamethasone or any component of the formulation. Some formulations contain sulfites
- Systemic fungal infections

Cautions

- **Elder Alert**
- Elderly: may be at increased risk of adverse effects such as hypertension, glucocorticoid induced osteoporosis
- Infections (bacterial, fungal, viral), latent or active tuberculosis, without concurrent appropriate antituberculous medications; due to immunosuppression
- Heart failure, hypertension, diabetes mellitus, diverticulitis, intestinal anastomoses, peptic ulcer, ulcerative colitis, myasthenia gravis, recent myocardial infarction, osteoporosis
- Vaccinations should not be given to those on high dose therapy due to possible neurological complications and lack of antibody response

DRUG INTERACTIONS

- Indomethacin –increased incidence of gastrointestinal perforation and GI hemorrhage

PREGNANCY/BREASTFEEDING

- Nonfluorinated corticosteroids are preferred (prednisone)
- Breastfeeding is recommended to be paused for min 4hrs.

RECOMMENDED

- Baseline potassium and blood glucose for short term high dose therapy. Repeat as required during therapy

Adverse Reactions

Occur with use of high doses for prolonged periods and are less likely to occur with short term use

CARDIOVASCULAR

- Transient hypotension, cardiopulmonary arrest (rare); myocardial rupture following acute myocardial infarction
- Fluid retention, hypertension, heart failure

ENDOCRINE

- Growth suppression in children, hyperglycemia, adrenal suppression

DERMATOLOGICAL

- Impaired wound healing, petechiae, ecchymosis

MISCELLANEOUS

- Bronchospasm, anaphylaxis (rare)
- Gastrointestinal perforation and GI hemorrhage in neonates.
- Nausea
- Depression, euphoria

Dosing

Pediatric:

- Croup/Asthma: 0.6mg/kg **PO** to a max of 16mg

Concentration Supplied:

- 4mg/ml

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** PO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/dexamethasone.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1772961?cesid=345KtgykygR&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DdexAMETHasone%26t%3Dname%26acs%3Dtrue%26acq%3Ddex
- https://web.p.ebscohost.com/nup/detail/detail?vid=26&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565192&db=nup

Development – May, 2023
Update – July 31, 2023

Dextrose/D50/D25/D10/Glucose HIGH ALERT

Classification

- Calorie supplement
- Monosaccharide

Indications

EMS INDICATIONS

- Treatment of insulin hypoglycemia (hyperinsulinism or insulin shock) to restore blood glucose levels when used in concentrations of 50% or 25%

HEALTH CANADA APPROVED

- *Treatment of insulin hypoglycemia (hyperinsulinism or insulin shock) to restore blood glucose levels when used in concentrations of 50% or 25%*
- *5% and 10% A source of carbohydrate calories*
- *Nutritional support when used in concentrations of 10% or less, when used with other nutrients*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Treatment of hyperkalemia when used with concomitant insulin when used at concentrations of 50%*

Mechanism of Action

- Increases glucose levels by minimizing glyconeogenesis
- Dextrose, a monosaccharide, is a source of calories and fluid for patients unable to obtain an adequate oral intake; may decrease body protein and nitrogen losses; promotes glycogen deposition in the liver. When used in the treatment of hyperkalemia (combined with insulin), dextrose stimulates the transient uptake of potassium by cells, especially in muscle tissue, lowering serum potassium.

Pharmacokinetics

- Dispersed through bloodstream
- **Onset:** rapid PO & IV
- **Peak:** rapid PO & IV
- **Duration:** brief PO & IV
- **Metabolism:** Metabolized to carbon dioxide and water

Contraindications

- Hypersensitivity to dextrose solution or any component of formulation
- Hypersensitivity to corn or corn products
- Neonates and children less than 50 kg: **maximum** concentration used is D25W
- Diabetic coma while patient is hyperglycemic; hepatic coma
- Intracranial or intraspinal hemorrhage; glucose-galactose malabsorption syndrome
- In the presence of delirium tremens in dehydrated patients

- Severe dehydration
- Dextrose solutions without electrolytes should not be administered simultaneously with blood through the same infusion set because of risk of pseudoagglutination of red cells. Cautions and contraindications may vary by blood component. Refer to manufacturer for further references

Cautions

- **HIGH ALERT**
- Diabetes mellitus or carbohydrate intolerance
- Ischemic stroke, as increased blood-glucose concentrations may worsen cerebral ischemic brain damage and impair recovery
- Hyponatremia may result from low sodium or sodium-free dextrose solutions with no other source of sodium
- Use with caution with patients susceptible to excessive fluid accumulation
- Excessive or rapid dextrose administration in very low birth weight infants have been associated with increased serum osmolality and possible intracerebral hemorrhage
- Rebound hypoglycemia may occur with abrupt withdrawal of a concentrated dextrose solution

MONITORING REQUIRED
DIRECT IV
- Observe injection site for pain, phlebitis or extravasation
- Monitor for hypersensitivity reaction(s)

RECOMMENDED
- Advise patients to report burning/stinging/pain at IV site promptly
- Blood glucose, serum electrolytes and acid-base balance
- Fluid balance

PREGNANCY/BREAST FEEDING
- Consult pharmacy or specialized on-line references for most recent information

Adverse Effects

METABOLIC
- Fluid and electrolyte imbalances, including hypokalemia and dehydration
- Hyperglycemia (associated with rates of administration over 0.5 g/kg/hour), hyperosmotic syndrome (mental confusion and loss of consciousness)
- Reactive hypoglycemia (after infusion). Reduce rate of administration gradually then follow with infusion of D5W or D10W

MISCELLANEOUS
- Local pain, venous thrombosis or phlebitis. Use a more dilute solution or consider central line administration

EXTRAVASATION
- 50% solution is hypertonic (2526 mOsm/L) and has a low pH (pH 4.2)

TREATMENT:
- Notify physician. Apply cold intermittent compresses. See site specific policy for intravenous therapy practice and clinical standards

Dosing

ADULT/ELDERLY

- Dose is dependent on use, weight, clinical condition and POCT results
- **Oral** glucose, if conscious and intact gag reflex administer in small amounts until desired effect obtained
- 12.5 to 25 grams D50W q 5 min. **SIVP** Repeat as required

ONGOING HYPOGLYCEMIA DUE TO OVERDOSE OF INSULIN SECRETAGOGUES

- Continuous infusions of D10W to D50W may be required
- **Contact Poison and Drug Information Service (PADIS) at 1-866-454-1212 for more information**

PEDIATRIC

- Dose is dependent on use, weight, clinical condition and POCT results
- **Oral** glucose, if conscious and intact gag reflex administer in small amounts until desired effect obtained
- 2 to 4ml/kg D25W q 5mins **SIVP**. Repeat as required

NEONATE

- 5-10ml/kg D10W **SIVP** prn

Concentration Supplied:

- 25 g/50mL
- Gel 31g

Reconstitution:

- D25W: pull 50ml of saline out of a 100ml bag and inject 50mls of D50W amp into the 100ml bag
- D10W: pull 50mls of saline out of 250ml bag and add 50mls of D50W into 250ml bag

COMPATABILITY

- Do not administer through the same infusion equipment as whole blood as haemolysis and clumping can occur

Route:

- **EMR:** PO (Oral Glucose)
- **PCP/ICP:** PO, IV
- **ACP/CCP:** PO, IV, IO, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/dextrose.pdf
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6724?cesid=0PvSGPsb1gL&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Ddextrose%26t%3Dname%26acs%3Dtrue%26acq%3Ddex
- https://web.p.ebscohost.com/nup/detail/detail?vid=28&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565194&db=nup

Development – May 2023
Update – July 31, 2023

DimenhyDRINATE/Gravol ELDER ALERT

Classification

- Antiemetic

Indications

EMS INDICATIONS

- Prevention and treatment of nausea, vomiting and/or vertigo; due to a variety of clinical scenarios including motion sickness, radiation sickness, postoperative vomiting, drug induced nausea and vomiting, Ménière's disease and other labyrinthine disturbances
- Hyperemesis gravidarum (pregnancy-associated nausea and vomiting)

SHA EMS Medical Direction Note:

- Not the first line choice as an antiemetic unless using to treat vertigo

HEALTH CANADA APPROVED

- *Prevention and treatment of nausea, vomiting and/or vertigo; due to a variety of clinical scenarios including motion sickness, radiation sickness, postoperative vomiting, drug induced nausea and vomiting, Ménière's disease and other labyrinthine disturbances*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Hyperemesis gravidarum (pregnancy-associated nausea and vomiting)*

Mechanism of Action

- Inhibit vestibular stimulation, acting on otolith system and semicircular canals
- Inhibits acetylcholine (cholinergic stimulation in vestibular and reticular systems may be responsible for motion sickness)
- Competes with histamine for H_1-receptor sites on effector cells in the gastrointestinal tract, blood vessels, and respiratory tract; blocks chemoreceptor trigger zone, diminishes vestibular stimulation, and depresses labyrinthine function through its central anticholinergic activity

Pharmacokinetics

- **Onset:** Rapid IV or 20 to 30 minutes IM
- **Peak:** 1-2hr IM, unknown IV
- **Duration:** 3-6hrs IM & IV
- **Metabolism:** Extensive in the liver to metabolites (diphenyl-methoxy-ethylamine, diphenyl-methoxy-acetic, diphenyl-methoxy-N-methylamine)
- **Excretion:** Renal

Contraindications

- Hypersensitivity to dimenhyDRINATE, diphenhydrAMINE, propylene glycol, or any other component of formulation
- Neonates

Cautions

- **ELDER ALERT**
- Elderly: may be inappropriate depending on comorbidities (e.g. dementia, delirium) due to its potential anticholinergic effects (Beers Criteria). May be more sensitive to adverse effects
- Patients in whom anticholinergic side effects would be detrimental (e.g. prostatic hypertrophy, bladder neck obstruction, narrow-angle glaucoma)
- Cardiovascular disease (including hypertension and ischemic heart disease), asthma or lower respiratory tract symptoms

DRUG INTERACTIONS

- May potentiate CNS depressant effects of opiates, barbiturates or other sedatives and ethanol
- May potentiate anticholinergic effects of drugs (e.g. tricyclic antidepressants)
- Ototoxic medication (e.g. aminoglycosides); may mask the symptoms of ototoxicity

PREGNANCY/BREASTFEEDING

- DimenhyDRINATE crosses the placenta. The risk of fetal abnormalities was not increased following maternal use of dimenhyDRINATE during any trimester of pregnancy.
- Drowsiness and irritability have been reported in breastfed infants exposed to antihistamines; of these effects, irritability was reported in one infant exposed to dimenhyDRINATE. The manufacturer recommends that the decision to continue or discontinue breastfeeding during therapy should take into account the risk of exposure to the infant and the benefits of treatment to the mother. In general, if a breastfed infant is exposed to a first generation antihistamine via breast milk, they should be monitored for irritability or drowsiness.

RECOMMENDED

- Monitor elderly patients for anticholinergic side effects (confusion, constipation, etc.)

Adverse Effects

CENTRAL NERVOUS SYSTEM

- Sedation – common particularly with high doses
- Dizziness, lassitude, headache, insomnia, nervousness, restlessness
- Paradoxical CNS stimulation, in young children (4), occasionally in adults (uncommon)

MISCELLANEOUS

- Hypersensitivity (rare)
- Dry mouth and respiratory airways
- Urinary retention
- Tachycardia
- Blurred vision

Dosing

Dilute to 10ml with NACL given SIVP over 2 to 4 minutes or dilute in 50ml mini bag infused over 20min

ADULT

- 25 to 50mg **IV/IM** q4 hours PRN
- Maximum 100 mg every 4 hours as required

ELDERLY

- 12.5mg **IV/IM** q4hrs PRN

PEDIATRIC

Children less than 12 years:

- 1 mg/kg (max 50mg) **IV/IM** q 4 to 6 hours as required

Children 12 years or older:

- 25 to 50 mg **IV/IM** every 4 to 6 hours as required
- Maximum dose: 300 mg in 24 hours

RENAL IMPAIRMENT ADJUSTMENTS
Creatinine Clearance (mL/minute)/Interval

- **10 to 50** every 6 to 8 hours
- **less than 10** every 8 hours

- HEPATIC IMPAIRMENT ADJUSTMENTS
- Dose reductions should be considered in patients with acute hepatic impairment since dimenhyDRINATE, is metabolised extensively in the liver

- HEMO/PERITONEAL DIALYSIS
- May cause excessive sedation in end stage renal disease
- Hemodialysis: 25 to 50 mg every 8 hours as required. Can be given anytime during dialysis
- CAPD: dose as for creatinine clearance less than 10 mL/min

Concentration Supplied:

- 50 mg/1 mL

Route

- **EMR:** Not in scope of practice
- **PCP/ICP:** IM, IV
- **ACP/CCP:** IM, IV, IO, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/dimenhyDRINATE.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6754?cesid=7AxwicYbIoD&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DdimenhyDRINATE%26t%3Dname%26acs%3Dtrue%26acq%3Ddim
- SaskKids Pediatric Parental Manual
- https://web.p.ebscohost.com/nup/detail/detail?vid=5&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535290&db=nup

Development – May 2023
Update - July 30, 2023

DiphenhydrAMINE/Benadryl ELDER ALERT

Classification

- Antihistamine

Indications

EMS INDICATIONS

- Symptomatic relief of allergic symptoms caused by histamine release including nasal allergies and allergic dermatosis
- adjunct to EPINEPHrine in the treatment of anaphylaxis

HEALTH CANADA APPROVED

- *Symptomatic relief of allergic symptoms caused by histamine release including nasal allergies and allergic dermatosis*
- *adjunct to EPINEPHrine in the treatment of anaphylaxis*
- *treatment of motion sickness*
- *management of Parkinsonian syndrome including drug-induced extrapyramidal symptoms (dystonic reactions) alone or in combination with centrally acting anticholinergic agents*

Mechanism of Action

- Competes with histamine for H_1-receptor sites on effector cells in the gastrointestinal tract, blood vessels, and respiratory tract; anticholinergic and sedative effects are also seen

Pharmacokinetics

- **Onset:** 20 – 30 minutes IM; Rapid IV
- **Peak:** 2 – 4 hours IM, unknown IV
- **Duration:** 4 to 8 hours IV & IN
- **Metabolized** rapidly, excreted as metabolites in the urine.

Contraindications

- Hypersensitivity to diphenhydrAMINE or dimenhyDRINATE or any component of formulation.

Cautions

- **ELDER ALERT**
- Elderly: due to high sedative and anticholinergic properties
- Patients in whom anti-cholinergic side effects would be detrimental e.g. prostatic hypertrophy, bladder neck obstruction, narrow-angle glaucoma.
- Cardiovascular disease (including hypertension and ischemic heart disease), bronchial asthma

DRUG INTERACTIONS

- May potentiate CNS depressant effects of opiates, barbiturates or other sedatives, tranquilizers, and ethanol
- May potentiate anticholinergic effects of drugs e.g. tricyclic antidepressants

PREGNANCY/BREASTFEEDING

- Maternal use of diphenhydramine has generally not resulted in an increased risk of birth defects. Fetal tachycardia, respiratory depression, and possible withdrawal symptoms (diarrhea, tremors) have been observed in case reports. Diphenhydramine may have an oxytocic effect following maternal overdose.
- Breastfeeding is contraindicated by the manufacturer. When treatment with an antihistamine is needed in breastfeeding women, second-generation antihistamines are preferred

RECOMMENDED

- Ambulate slowly and carefully; may cause dizziness, sedation or disturbed coordination.

Adverse Effects

CARDIOVASCULAR

- Chest tightness, extrasystoles, hypotension, palpitations, tachycardia

CNS

- Sedation - common particularly with high doses, sleepiness
- Dizziness, blurred vision, headache, disturbed coordination
- Paradoxical CNS stimulation in young children, occasionally in adults (uncommon)

MISCELLANEOUS

- Hypersensitivity. (Rare)
- Dry mouth and thickening of bronchial secretions (Common)
- Urinary retention

Dosing

ADULT

- 1mg/kg **IV infusion** (max of 50mg) in 50ml NaCl @ 200mls/hr (15min) or can be given **IM** undiluted.

ELDERLY

- 1mg/kg **IV infusion** (max of 50mg) in 50ml NaCl @ 200mls/hr (15min) or can be given **IM** undiluted.

***side effects may be more pronounced in elderly**

PEDIATRIC

- 1mg/kg **IV infusion** (max of 50mg) in 50ml NaCl @ 200mls/hr (15min) or can be given **IM** undiluted.

NEONATE

- Not recommended

HEMO/PERITONEAL DIALYSIS

- No dosage adjustment needed however, may cause excessive sedation in end stage renal disease.

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IV

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/diphenhydrAMINE.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1827019?cesid=2jLTGtF2OGe&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DdiphenhydrAMINE%26t%3Dname%26acs%3Dtrue%26acq%3Ddiphe
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=9eae3cac-5d73-4548-9e94-e9ab86b7f319%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565201&db=nup

Development – May 12, 2023
Update - July 31, 2023

Entonox/Nitrous Oxide

Classification

- Gaseous Analgesic – 50% Nitrous Oxide/50% Oxygen

Indications

EMS INDICATIONS

- Pain associated with musculoskeletal injuries
- Cardiac chest pain
- Burns without inhalation injury
- Active labour

HEALTH CANADA APPROVED

- *Pain associated with musculoskeletal injuries*
- *Cardiac chest pain*
- *Burns without inhalation injury*
- *Active labour*

Mechanism of Action

- Causes the release of biochemical substances such an endorphins and serotonin
- Takes effect within the brain, as well as the spinal cord, inhibiting pain impulses by stimulating various receptors and altering pain pathways
- General CNS depressant action; may act similar to inhaled general anesthetics by stabilizing axonal membranes to partially inhibit action potentials leading to sedation; may partially act on opiate receptor systems to cause mild analgesia; central sympathetic stimulating action supports blood pressure, systemic vascular resistance, and cardiac output; it does not depress carbon dioxide drive to breath. Nitrous oxide increases cerebral blood flow and intracranial pressure while decreasing hepatic and renal blood flow; has analgesic action similar to morphine.

Pharmacokinetics

- **Onset:** inhalation 2-5mins
- **Absorbed** through the lungs
- **Duration:** rapid ~ 60 seconds
- **Excretion:** Primarily exhaled gases; skin (minimal amounts)
- Does not need to be activated by the body as it is active in its current form

Contraindications

- Head injury with impaired consciousness
- Inebriation
- Heavily sedated (e.g. overdose, street drugs)
- Severe facial injuries
- Inability to self-administer (too young mentally challenged, senile)
- Chest trauma (e.g. pneumonia)
- Decompression sickness
- Vitamin B_{12} deficiency, folate, or methionine synthesis or metabolism; patients having undergone vitreoretinal surgery and presence of intraocular gas bubble; and patients with pneumothorax, pneumocephalus, and closed dura, or those at high risk for vascular air embolus.

Cautions

- Invert tank 3 times prior to use
- Patient must self-administer
- Tank must be stored in the horizontal position
- Do not use in the outdoor environment if the temperature is below -6◦ C
- Use caution if patient with suspected bowel obstruction
- Addictive: May be associated with abuse and/or addiction (Zafirova 2018).
- Body space volume expansion: Both compliant (eg, bowel gas, pneumothorax) and poorly compliant (eg, middle ear) body spaces may be prone to changes in volume due to nitrous oxide transfer; avoid use in pneumothorax, pneumocephalus, middle ear surgery, or bowel obstruction.
- Bone marrow suppression: Prolonged use may produce bone marrow suppression; patients with vitamin B_{12} deficiency (pernicious anemia) and those with other nutritional deficiencies (patients with alcohol use disorder) are at increased risk.
- Nausea/vomiting: Occurs postoperatively in ~15% of patients (Sun 2015); risk may be reduced by antiemetics.
- Neurologic effects: Prolonged use may produce neurologic dysfunction; patients with vitamin B_{12} deficiency (pernicious anemia) and those with other nutritional deficiencies (patients with alcohol use disorder) are at increased risk.
- Vitreoretinal surgery: Detached retina and other ocular disorders treated with vitreoretinal surgery where intraocular gas was used: Nitrous oxide can increase intraocular pressure which may result in retinal artery occlusion, ischemia, or optic nerve damage and vision loss in these patients. Nitrous oxide should not be used in patients who have had an intravitreal gas bubble unless it can be confirmed that the bubble has been completely resorbed.

Adverse Effects

GASTROINTESTINAL

- Nausea, vomiting

CENTRAL NERVOUS SYSTEM

- Potentiate the effects of other CNS depressants (narcotics, sedatives, alcohol, hypnotics)
- Light-headedness
- Drowsiness

OTIC

- Increased middle ear pressure (with transient auditory impairment, hemotympanum, otalgia, and perforated tympanic membrane), tinnitus.

RESPIRATORY

- Atelectasis, hypoxia

Dosing

ADULT/ELDERLY

- Self-administered via **inhalation** by patient until pain is relieved, PRN

PEDIATRIC

- Self-administered via **inhalation** by patient until pain is relieved, PRN

NOTE: must document amount used by patient (psi) on PCR

Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** deep inhalation with hepa filter and valve (mouth piece)
- **ACP/CCP:** deep inhalation with hepa filter and valve (mouth piece)

Resources:

- SHA EMS Medical Director & Advisors
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7366?cesid=8oDqdpfOSJA&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dnitrous%2Boxide%26t%3Dname%26acs%3Dtrue%26acq%3Dnitrou

Development – May 2023
Update – July 31, 2023

EPINEPHrine HIGH ALERT/ELDER ALERT

Classification

- Sympathomimetic

Indications

EMS INDICATIONS

- EMRs can only administer Epi auto-injector for anaphylaxis
- Treatment of anaphylaxis and/or severe acute asthmatic attacks
- Treatment of cardiac arrest
- Croup
- Profound bradycardia or hypotension

HEALTH CANADA APPROVED

- *Treatment of anaphylaxis and/or severe acute asthmatic attacks*
- *Treatment of cardiac arrest and/or Adams-Stokes Syndrome*
- *Croup*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Profound bradycardia or hypotension*
- *To provoke arrhythmia to diagnose primary cardiac electrical disease (e.g. catecholaminergic ventricular tachycardia)*

Mechanism of Action

- Stimulates alpha-, beta$_1$-, and beta$_2$-adrenergic receptors resulting in relaxation of smooth muscle of the bronchial tree, cardiac stimulation (increasing myocardial oxygen consumption), and dilation of skeletal muscle vasculature; small doses can cause vasodilation via beta$_2$-vascular receptors; large doses may produce constriction of skeletal and vascular smooth muscle. Epinephrine also inhibits histamine release.

Pharmacokinetics

- **Onset:** Immediate **IV**, 1 -5 min **inhalation**, 5 – 15 mins **S**Q
- **Peak:** 5 min **IV**, 30 min **SQ**
- **Duration:** 1 – 4 hrs
- **Metabolism:** Disappears rapidly in bloodstream, degraded by the liver enzymes and excreted by urine

Contraindications

- Hypersensitivity to EPINEPHrine or other sympathomimetics or sulfites. No absolute contraindications to use in life threatening conditions

Cautions

- **HIGH ALERT/ ELDER ALERT**
- Elderly: may be more susceptible to beta-adrenergic effects (e.g. hypertension, hypokalemia, tachycardia, tremor)
- Hyperthyroidism, narrow- (closed-) angle glaucoma, diabetes (may transiently increase blood glucose levels)
- Cardiovascular disease such as ischemic heart disease, arrhythmia or tachycardia, occlusive vascular disorders including arteriosclerosis, hypertension or aneurysms

Adverse Effects

CARDIOVASCULAR

- Excessive rise in BP
- Arrhythmias (PVC's and ventricular tachycardia)
- Palpitations
- Anginal pain

CENTRAL NERVOUS SYSTEM

- Anxiety
- Dizziness
- Headache
- Cerebral haemorrhage: due to hypertension

MISCELLANEOUS

- Pulmonary edema due to peripheral constriction and cardiac stimulation: a vasodilator (e.g. nitrates), or an alphaadrenergic blocker (e.g. phentolamine), may be required

EXTRAVASATION

- Results in sloughing and necrosis

TREATMENT

- Stop infusion and notify physician.

Dosing

ANAPHYLAXIS (NORMOTENSIVE):

ADULTS

- **IM:** 0.5 mg Epi 1: 1 000

PEDS

- **IM** (deltoid or vastus lateralis)**:** 0.01mg/kg Epi 1:1 000 to a maximum of 0.5 mg

EMR: Epi auto-injector Adult: 0.3 mg **Peds**: 0.15 mg

STATUS ASTHMATICUS:

ADULTS

- **SC/IM**: 0.3 mg-0.5 mg Epi 1:1 000

PEDS

- **SC/IM**: 0.01mg/kg Epi 1:1 000 to a maximum of 0.5 mg

CROUP:

- **Less than 5 kg:** 0.5 mg/kg Epi 1:1 000 to maximum 2.5 mg in 2-3 mls NaCl **Nebulized**
- **Greater than 5 kg:** 2.5-5 mg Epi 1:1 000 mixed in 2-3 mls NaCl **Nebulized**

ANAPHYLAXIS (HYPOTENSIVE):

ADULTS

- **IV:** 100 mcg (10ml) Epi 1: 100 000 SIVP over several minutes, repeat q 5 minutes if needed.

PEDS

- **IV:** 1mcg/kg Epi 1:100 000 q 2-5minutes if needed

CARDIAC ARREST:

ADULTS

- **IV:** 1 mg Epi 1:10 000 q 3-5 minutes
- **ETT:** 3mg (add 2- 1:1 000 to 1:10 000 preload)

PEDS

- **IV:** 0.01mg/kg (0.1 ml/kg) Epi 1:10 000 q 3-5 minutes.
- **ETT:** 0.1mg/kg (0.1ml/kg) Epi 1:1 000 q 3-5 minutes

NEONATES (Less than 28 days)

- **IV**: 0.02mg/kg Epi 1:10 000 q 3-5 minutes
- **ETT**: 0.1mg/kg Epi 1:10 000 q 3-5 minutes

SYMPTOMATIC BRADYCARDIA/CARDIOGENIC SHOCK:

ADULTS (**EPI INFUSION**)

- [Quad strength mixed as follows: Concentration 4 mg/250 ml = 16 mcg/ml, Mix 4 mg Epi 1:1 000 in 250 ml bag NaCl]; run at 0.1 mcg/kg/min, titrate at 0.1 mcg/kg/min q 3-5 min **via IV infusion on pump**

PEDS

- **IV:** 0.01mg/kg (0.1ml/kg) Epi 1:10 000 q 3-5 minutes
- **ETT:** 0.1mg/kg (0.1ml/kg) Epi 1:1 000 q 3-5 minutes

NEONATES (Less than 28 days)

- **IV:** 0.02mg/kg Epi 1:10 000 q 3-5 minutes
- **ETT**: 0.1mg/kg Epi 1:10 000 q 3-5 minutes

PERI/POST ARREST SHOCK (**PUSH DOSE EPI**):

- Must reconstitute to 1: 100 000 [add 1 ml of 1:1 000 Epinephrine to 100ml NaCl], concentration is 10 mcg/ml

ADULT

- 5 mcg (0.5ml)-50 mcg (5ml) q 2-5 minutes **IVP**

PEDS

- 1mcg/kg Epi 1:100 000 q 2-5minutes **IVP**

Concentration Supplied:

- 0.1mg/ml (10ml preload) (1:10 000)
- 1mg/ml (1ml amp) (1:1 000)

Route:

- **EMR:** Auto Injector only
- **PCP/ICP:** IM, SQ, Inhaled
- **ACP/CCP:** IM, SQ, Inhaled, IV, IO, ET

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/EPINEPHrine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/5925339?cesid=2YctnSJEVTN&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DEPINEPHrine%26t%3Dname%26acs%3Dtrue%26acq%3Depi
- ACLS Experienced Provider 2017
- PALS 2020

Development – May 23, 2023

Update – July 31, 2023

FentaNYL HIGH ALERT/ELDER ALERT

Classification

- Opiate agonist - Narcotic Analgesic

Indications

EMS INDICATIONS

- In anesthesia as an analgesic, an adjunct to general and regional anesthesia, and as an anesthetic for induction and maintenance
- Temporary relief of moderate to severe pain

HEALTH CANADA APPROVED

- *In anesthesia as an analgesic, an adjunct to general and regional anesthesia, and as an anesthetic for induction and maintenance*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Temporary relief of moderate to severe pain*

Mechanism of Action

- Binds with stereospecific receptors at many sites within the CNS, increases pain threshold, alters pain reception, and inhibits ascending pain pathways.

Pharmacokinetics

- **Onset:** 1 to 2 minutes
- **Peak:** 3 minutes
- **Duration:** 5 to 10 minutes
- **Metabolized** through the liver and other tissues by a combination of reactions

Contraindications

- Hypersensitivity to fentaNYL or any component of formulation. Cross reaction may occur with meperidine and SUFentanil

Cautions

- **HIGH ALERT/ELDER ALERT**
- Elderly: May be more sensitive to adverse effects, including life-threatening respiratory depression.
- Debilitated patients: Is a greater potential for critical respiratory depression, even at therapeutic dosages
- Respiratory disease: Monitor for respiratory depression in patients with significant chronic obstructive pulmonary disease or cor pulmonale and patients having a substantially decreased respiratory reserve, hypoxia, hypercarbia, or preexisting respiratory depression, particularly when initiating therapy and titrating therapy; critical respiratory depression may occur, even at therapeutic dosages

- Hypovolemia, cardiovascular disease (including acute MI), circulatory shock: Potential vasodilation + hypotension
- CNS depression/coma: Are susceptible to intracranial effects of CO2 retention
- Biliary tract dysfunction or acute pancreatitis: May cause constriction of sphincter of Oddi
- Sleep-disordered breathing: Use with caution for chronic pain and titrate dosage cautiously in patients with risk factors for sleep-disordered breathing, including heart failure and obesity
- Head trauma, intracranial lesions, or elevated intracranial pressure: Respiratory depressant effects (with CO2 retention and secondary elevation of CSF pressure) may be markedly exaggerated
- Abdominal conditions: May obscure diagnosis or clinical course
- Adrenocortical insufficiency: including Addison disease. Long-term opioid use may cause secondary hypogonadism
- Delirium tremens, hepatic or renal impairment, obesity, prostatic hyperplasia/urinary stricture, psychosis, thyroid dysfunction. Seizure disorders: May cause or exacerbate preexisting seizures
- Patients on opioids for chronic pain, patient with opioid use disorder, patient on opioid agonist therapy – may require consultation to specialist (e.g. anesthesiology, addictions medicine)
- fentaNYL can accumulate in lipid stores when used for extended periods of time and may result in prolonged sedation and reduced ability to liberate from mechanical ventilator

DRUG INTERACTIONS

- Benzodiazepines or other CNS depressants: May result in profound sedation, respiratory depression, coma, and death
- Is metabolized by cytochrome P450 3A4; concomitant use with any 3A4 inhibitors may result in an increase in fentaNYL plasma concentrations, which could increase or prolong adverse reactions and may cause potentially fatal respiratory depression. Discontinuation of a concomitantly used 3A4 inducer may result in an increase in fentaNYL plasma concentration. Review drug profile at time of initiation and with any change in medication regimen

MONITORING REQUIRED

- As per site policy/standard work

ADULT BASELINE

- RR, HR, BP, sedation scale before dose or start of infusion

DIRECT IV

- RR, HR, BP, sedation scale, at 5 and 15 minutes post dose

PEDIATRIC/NEONATE BASELINE

- RR, HR, BP, sedation scale before dose or start of infusion

DIRECT IV

- RR, HR, BP, sedation scale, at 5 and 15 minutes post dose
- Continuous electronic respiratory monitoring and pulse oximetry during and for 15 minutes post dose
- Observe patient continually for 15 minutes post dose for signs/symptoms of apnea and/or muscle rigidity

RECOMMENDED

- Monitor fluid intake and urine output; check for bladder distension
- Check for abdominal distension, gas or constipation

NEONATE

- Monitor for chest wall rigidity is related to high doses and rapid escalation to moderate doses; rigidity may be prevented by concomitant use of neuromuscular blocking agents with mechanical ventilation
- For Intubation: monitor urine output post dose

Adverse Effects

CARDIOVASCULAR

- Bradycardia; which may be treated with atropine
- Hypotension. Orthostatic hypotension in ambulatory patients
- Peripheral edema
-

CENTRAL NERVOUS SYSTEM

- Sedation (common)
- Confusion
- Dizziness
- Fatigue

GASTROINTESTINAL

- Nausea/vomiting
- Constipation - diminished propulsive peristaltic waves in GI tract

RESPIRATORY

- Respiratory depression and apnea; may be severe, requiring maintenance of an adequate airway, use of resuscitative equipment, and administration of oxygen, naloxone, and/or other resuscitative drugs
- Muscular rigidity. Treatment: naloxone IV and respiratory support as required. Associated with speed of administration, reduced by use of slow intravenous injection.

MISCELLANEOUS

- Hyperhidrosis (excessive sweating)
- Hypokalemia

NEONATE

- Neonatal withdrawal syndrome: may be life-threatening. Signs and symptoms include irritability, hyperactivity, abnormal sleep pattern, high-pitched cry, tremor, vomiting, diarrhea, and failure to gain weight. Onset, durations and severity depend on the drug used, duration of use, maternal dose, and rate of drug elimination by the newborn.

Dosing

*Optimal analgesic dose varies widely among patients; while doses should be titrated to pain management, consideration of sedation level and respiratory status will also guide dosing
** Best Practice when giving medication that can lower the patient's blood pressure is to start an IV and administer the medication that route. Initial doses situation depending (can't get an IV or BP is adequate) can give other routes but multiple doses should have an IV in place if possible.

ADULT:

- Pain: 0.5- 2mcg/kg **IV/IM/IN** q 10min PRN (consider using lower end dose for repeat doses)
- MFI: 3.5mcg/kg (max 250 mcg) (↓BP 1-3mcg/kg) **IVP**
- MFI Maintenance: 25-50mcg **IVP**

ELDERLY:

- Pain: 0.5- 1mcg/kg **IV/IM/IN**, repeat 0.25- 0.5mcg/kg **IV/IM/IN** q 10 min PRN

PEDIATRIC:

- Pain: 0.5 – 2mcg/kg **IV/IM** q 10min PRN (consider using lower end for repeat doses); 1.5-2mcg/kg **IN**
- MFI: 1-2 mcg/kg (max 200mcg) **IVP**
- MFI Maintenance: 1mcg/kg (max 25mcg) **IVP**

MISCELLANEOUS

- 100 mcg fentaNYL is approximately equianalgesic to 10 mg morphine

Concentration Supplied:

- 50mcg/ml (5ml vial)

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO, IN, monitor infusion

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/fentaNYL.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6903?cesid=9HMgqekRc32&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DfentaNYL%26t%3Dname%26acs%3Dtrue%26acq%3Dfentr

Development – May 12, 2023
Update – July 31, 2023

Glucagon

Classification

- Hyperglycemic agent
- Pancreatic hormone

Indications

SHA EMS MEDICAL DIRECTION

- Treatment of severe hypoglycemic reactions. IV glucose is preferred over glucagon IM

HEALTH CANADA APPROVED

- *Induction of a hypotonic state and smooth muscle relaxation in the radiological examination of the stomach, duodenum, small bowel and colon*
- *Treatment of severe hypoglycemic reactions. IV glucose is preferred over glucagon IV*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN THE LITERATURE

- *Beta blocker poisoning: Should be used early in treatment of bradycardia and hypotension*
- *In treatment of bradycardia and hypotension associated with calcium channel blocker poisoning but not as first choice agent*
- *Treatment of foreign body obstruction in esophagus*

Mechanism of Action

- Stimulates adenylate cyclase to produce an increase in cyclic AMP, which promotes hepatic glycogenolysis and gluconeogenesis causing an increase in blood glucose levels; antihypoglycemic effect requires preexisting hepatic glycogen stores. Extra hepatic effects of glucagon include relaxation of the smooth muscle of the stomach, duodenum, small bowel, and colon.
- In the setting of beta-blocker and calcium channel blocker toxicity, the glucagon-mediated increase in cyclic AMP increases automaticity at the sinoatrial and atrioventricular nodes. In addition, glucagon improves myocardial contractility and produces peripheral vasodilation.

Pharmacokinetics

- **Onset:** 10 minutes SQ, IM, IV (hypoglycemia treatment); 45 seconds IV, 4-10 minutes IM (GI relaxation)
- **Peak:** 30-45 minutes SQ, 30 mins IM, 5-20 mins IV
- **Duration:** 60-90minutes or greater SQ, IM, IV (hypoglycemia treatment); 9-25 minutes IV ,12-32minutes IM (GI relaxation)
- **Metabolised** primarily in the liver
- **Half-life:** 32 minutes SQ, 26-45 IM, 8-18 minutes IV

Contraindications

- Hypersensitivity to glucagon or any component of formulation
- Phreochromocytoma: may cause release of catecholamines producing marked hypertension

Cautions

- Insulinoma: may induce hypoglycemia due to its insulin-releasing effect
- Starvation, adrenal insufficiency, and chronic hypoglycemia: due to marked depletion of liver glyocogen stores, glucagon is not effective in the treatment of hypoglycemia

PREGNANCY/BREASTFEEDING

- In general, medications used as antidotes should take into consideration the health and prognosis of the mother; antidotes should be administered to pregnant females if there is a clear indication for use and should not be withheld because of concerns of teratogenicity.
- Glucagon is not absorbed from the GI tract and therefore, it is unlikely adverse effects would occur in a breastfeeding infant.

RECOMMENDED

- Serum potassium and blood glucose concentrations

MISCELLANEOUS

- Glucagon depletes glycogen stores.

Adverse Effects

GASTROINTESTINAL

- Nausea and vomiting, higher incidence with doses of 2 mg or greater. Antiemetics are indicated when large doses are given

CARDIOVASCULAR

- Transient increase in BP and HR, (with large doses). Responds to IV phentolamine if treatment is required **HA**

METABOLIC

- Hypokalemia, hyperglycemia (excessive dosage)

HYPERSENSITIVITY (Rare)

- Anaphylaxis, uticaria, respiratory distress and hypotension

Dosing

ADULT/ELDERLY

- Hypoglycemia: 1 mg **IM/SQ**. usually awakens an unconscious patient within 15 minutes. May repeat in 15 minutes as needed. Note: IV dextrose should be administered as soon as it is available; if patient fails to respond to glucagon, IV dextrose must be given

PEDIATRIC

- Hypoglycemia: less than 12 years: 0.1mg/kg to a max of 1mg **IM/SQ**
  greater than 12 years: 1 mg **IM/SQ**
- Usually awakens an unconscious patient within 15 minutes. May repeat in 15 minutes as needed. Note: IV dextrose should be administered as soon as it is available; if patient fails to respond to glucagon, IV dextrose must be given

NEONATE

- Hypoglycemia: 200 mcg/kg (0.2 mg/kg). Max dose 1 mg **IM/SQ**

Concentration Supplied:

- Available as glucagon 1 mg (1 unit) vial and 1 mL glycerin as a diluting solution

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** IM, SQ
- **ACP/CCP:** IM, SQ, IV

*Recommended route IM/SQ otherwise IV D50W should be used

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/glucagon.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6983?cesid=6iozocXtAED&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dglucagon%26t%3Dname%26acs%3Dtrue%26acq%3Dglu
- SaskKids Pediatric Parental Manual

Development – May 2023
Update – July 31, 2023

Haloperidol/Haldol ELDER ALERT

Classification

- Antipsychotic

Indications

EMS INDICATIONS

- For IM use only
- Acute delirium in emergency situations or where oral access is limited and in the absence of a history of seizures, head injury, the use of QT prolonging drugs (tricyclic anti-depressants, procainamide, stemetil etc.), drug toxicity (use of cocaine, etc)

*EMS INDICATIONS FOR **PALLIATIVE** USE UPON COMPLETING PALLIATIVE TRAINING*

- *For the **Palliative Patient** experiencing restlessness/early delirium*

HEALTH CANADA APPROVED

- *For IM use only*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Acute delirium in emergency situations or where oral access is limited*
- *Antiemetic in cancer chemotherapy*

Mechanism of Action

- Haloperidol is a butyrophenone antipsychotic that nonselectively blocks postsynaptic dopaminergic D_2 receptors in the brain

Pharmacokinetics

- **Onset:** 15 – 30 minutes IM, 3-20 minutes IV
- **Peak**: 25-30 minutes IM, 30 minutes IV
- **Duration:** 2 hours or greater IM, 3-24 hours
- **Half-life:** 20 hours IM, 14-26 hours IV
- **Excretion:** Urine (30%, 1% as unchanged drug)
- **Metabolism:** Hepatic

Contraindications

- Hypersensitivity to haloperidol or any component of formulation
- Severe toxic central nervous system depression or comatose states
- Parkinson's syndrome

Cautions

- **Elder Alert**
- Elderly; sensitivity to postural hypotension, anticholinergic and sedative effects increased. Increased risk of extrapyramidal side effects especially in elderly women
- Falls: May increase the risk for falls due to somnolence, orthostatic hypotension, and motor or sensory instability.
- Elderly patients with dementia-related psychosis; increased risk of mortality and cerebrovascular accidents
- Conditions that prolong QT interval, including electrolyte imbalance (particularly hypokalemia and hypomagnesemia), underlying cardiac abnormalities, hypothyroidism, and familial long QT syndrome
- History of cardiovascular disease, ECG monitoring highly recommended
- Cardiovascular disease: Use with caution in patients with severe cardiovascular disease because of the possibility of transient hypotension and/or precipitation of angina pain.
- Bipolar disorder: Use with caution in patients with bipolar disorder; when used to control mania, there may be a rapid mood swing to depression. Haloperidol does not possess antidepressant effects.
- Myasthenia gravis: Use with caution in patients with myasthenia gravis; may exacerbate condition.
- Parkinson disease: Haloperidol is contraindicated in patients with Parkinson disease; these patients are reported to be more sensitive to antipsychotic medications and use may result in severe extrapyramidal symptoms, confusion, sedation, and falls.
- History of convulsive disorders; may lower seizure threshold
- Thyrotoxicosis; severe neurotoxicity (e.g. rigidity, inability to walk or talk) may occur
  Additional restraint may be required due to the slow onset of haloperidol (10 to 30 minutes)

BLACK BOX WARNING:

- Older patients have an increased risk of adverse reactions to antipsychotics and there is a black box warning about increased risk of death in older patients with dementia who are treated with antipsychotics. In light of this risk, and relative to their small beneficial effect in the treatment of dementia-related psychosis and behavioral disorders, patients should be evaluated for possible reversible causes before being started on an antipsychotic. Nonpharmacologic interventions should be tried before initiating an antipsychotic.

DRUG INTERACTIONS

- CNS depressants (e.g. narcotics, benzodiazepines or anaesthetics): additive or potentiating effects
- Drugs that may prolong the QTc interval: possible additive effect. Avoid concurrent use
- EPINEPHrine: haloperidol blocks or reverses pressor effect and further lowers BP
- Is a substrate of cytochrome P450 isoenzymes CYP2D6 (major) and CYP3A4 (major); Interacts with many drugs - contact pharmacy for more information. Review drug profile at time of initiation and with any change in medication regimen

PREGNANCY/BREASTFEEDING

- Haloperidol crosses the placenta in humans. Although haloperidol has not been found to be a major human teratogen, an association with limb malformations following first trimester exposure in humans cannot be ruled out. Antipsychotic use during the third trimester of pregnancy has a risk for abnormal muscle movements (extrapyramidal symptoms) and withdrawal symptoms in newborns following delivery. Symptoms in the newborn may include agitation, feeding disorder, hypertonia, hypotonia, respiratory distress, somnolence, and tremor; these effects may be self-limiting or require hospitalization. If needed, the minimum effective maternal dose should be used in order to decrease the risk of EPS.
- Haloperidol has been detected in the plasma and urine of breastfeeding infants. Adverse events have been reported in some infants exposed to haloperidol via breast milk. Gynecomastia and galactorrhea are known side effects with the use of haloperidol. Breastfeeding is not recommended by the manufacturer. Some guidelines do not recommend initiating haloperidol in patients who are breastfeeding. Other guidelines note that if a first-generation antipsychotic is required, haloperidol is preferred; infants should be monitored for adverse events.

MONITORING REQUIRED

- Baseline BP and then at 15 minutes

RECOMMENDED

- Health Canada and the FDA recommend ECG and QTc monitoring. Notify physician if QTc interval is greater than 450 ms or an increase of 10 to 25% in QTc occurs
- Serum magnesium and potassium levels: hypomagnesium and hypokalemia increase risk for QT prolongation
- Assess for signs of extrapyramidal side effects, e.g. rigidity, fine tremor of limbs, upward rotation of eyes

Adverse Effects

CARDIOVASCULAR

- Cardiac conduction disturbances e.g. prolonged QTc interval, torsades de pointes; risk increases with IV use or at doses higher than recommended
- Tachycardia
- Hypotension
- Hypertension
- Precipitation of anginal pain

CENTRAL NERVOUS SYSTEM

- Extrapyramidal symptoms: dystonic reactions, akathisia. Symptoms respond to treatment with anticholinergic agents (i.e. IV diphenhydrAMINE or benztropine)
- Neuroleptic malignant syndrome characterized by muscular rigidity, hyperpyrexia, autonomic instability and marked changes in mental status (Rare)

Dosing

ADULT AND OLDER THAN 12YRS

- **IM** 2.5 – 5mg

ELDERLY/DEBILITATED

- **IM** 1 – 2.5mg

Palliative Patient

Delirium or Restlessness (adult)

- *2.5-5mg **SQ or PO** q 30mins until desired effect is achieved then follow with maintenance dose of the amount given to achieve desired effect **SQ or PO** q 2hrs*

RENAL IMPAIRMENT ADJUSTMENTS

- Creatinine clearance less than 10 mL/minute: start with lower doses
- For single doses use 100% of normal dose
- Accumulation with repeated dosage

Concentration Supplied:

- 10mg/1 ml (1ml amp)

COMPATIBILITY/STABILITY

- Stable D5W (max conc. 3 mg/mL) for 24 hours at room temperature
- Dilution in NS is not recommended, however lines may be flushed with NS
- Incompatible with heparin - recommended that lines be flushed with NS or D5W before and after injecting haloperidol into an injection port. Administration through a heparin lock would require a similar flushing procedure.

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IV

***IM is the recommended route

Resources:

- SHA EMS Medical Director & Advisors
- *Palliative Program (2021)*
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/haloperidol.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7019?cesid=60z7SrsmNuF&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dhaloperidol%26t%3Dname%26acs%3Dtrue%26acq%3Dhal

Development – May 08, 2023
Update – July 31, 2023

HYDROmorphone HIGH ALERT/ELDER ALERT

Classification

- Opiate Agonist/Narcotic Analgesic

Indications

*EMS INDICATIONS FOR **PALLIATIVE** USE UPON COMPLETING PALLIATIVE TRAINING*

- *Pain management for **Palliative patient** already taking HYDROmorphone*

HEALTH CANADA APPROVED

- *Relief of moderate to severe pain*

Mechanism of Action

- Binds to opioid receptors in the CNS, causing inhibition of ascending pain pathways, altering the perception of and response to pain; causes cough suppression by direct central action in the medulla; produces generalized CNS depression

Pharmacokinetics

- **Onset:** 15 to 30 minutes PO, 5 minutes IV
- **Peak:** 30 - 60 minutes PO, 10 to 20 minutes IV
- **Duration:** 3 to 4 hours PO & IV
- **Half-life:** 2 to 3 hours PO & IV
- **Excretion:** Urine (primarily as glucuronide conjugates); minimal unchanged drug is excreted in urine (~7%) and feces (1%)

Contraindications

- Hypersensitivity to HYDROmorphone or any component of formulation. Cross sensitivity may occur with codeine, morphine, oxyCODONE or oxymorphone

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly: May be more sensitive to adverse effects, including life-threatening respiratory depression. Decrease initial dose. In setting of chronic pain, monitor closely due to an increased potential for risks, including certain risks such as falls/fracture, cognitive impairment, and constipation. Clearance may also be reduced in older adults (with or without renal impairment) resulting in a narrow therapeutic window and increasing risk for respiratory depression or overdose
- Cachectic or debilitated patients: Is a greater potential for critical respiratory depression, even at therapeutic dosages

- Respiratory disease: Monitor for respiratory depression in patients with significant chronic obstructive pulmonary disease or cor pulmonale and patients having a substantially decreased respiratory reserve, hypoxia, hypercarbia, or preexisting respiratory depression, particularly when initiating therapy and titrating therapy; critical respiratory depression may occur, even at therapeutic dosages
- Sleep-disordered breathing: Use with caution for chronic pain and titrate dosage cautiously in patients with risk factors for sleep-disordered breathing, including HF and obesity
- Hypovolemia, cardiovascular disease (including acute MI), circulatory shock: Potential vasodilation + hypotension
- Head trauma, intracranial lesions, or elevated intracranial pressure: Respiratory depressant effects (with CO2 retention and secondary elevation of CSF pressure) may be markedly exaggerated
- CNS depression/coma: Are susceptible to intracranial effects of CO2 retention
- Abdominal conditions: May obscure diagnosis or clinical course
- Adrenocortical insufficiency: including Addison disease. Long-term opioid use may cause secondary hypogonadism
- Biliary tract dysfunction or acute pancreatitis: May cause constriction of sphincter of Oddi
- Delirium tremens, hepatic or renal impairment, obesity, prostatic hyperplasia/urinary stricture, psychosis, thyroid dysfunction
- Seizure disorders: May cause or exacerbate preexisting seizures
- Patients on opioids for chronic pain, patient with opioid use disorder, patient on opioid agonist therapy – may require consultation to specialist (e.g. anesthesiology, addictions medicine)

DRUG INTERACTIONS

- Benzodiazepines or other CNS depressants: May result in profound sedation, respiratory depression, coma, and death
- Other potentially significant interactions may exist, requiring dose or frequency adjustment, additional monitoring, and/or selection of alternative therapy. Consult drug interactions database for more detailed information.

PREGNANCY/BREASTFEEDING

- According to some studies, maternal use of opioids may be associated with birth defects (including neural tube defects, congenital heart defects, and gastroschisis), poor fetal growth, stillbirth, and preterm delivery.
- Progressive lethargy requiring treatment with naloxone was noted in a 6-day old infant exposed to hydromorphone via breast milk. Withdrawal symptoms may occur when maternal use is discontinued or breastfeeding is stopped. Breastfeeding women using opioids for postpartum pain or for the treatment of chronic maternal pain should monitor their infants for drowsiness, sedation, feeding difficulties, or limpness.

MONITORING REQUIRED

All Ages Baseline

- RR, HR, BP and sedation scale before dose

All Ages Direct IV

- RR, HR, BP, sedation scale, at 5 and 15 minutes post dose

Pediatric Direct IV:

In addition to above

- Observe patient continually for 5 minutes post dose for signs/symptoms of respiratory depression

RECOMMENDED

- Monitor fluid intake and output; check for bladder distension
- Check for abdominal distension, gas or constipation

Adverse Effects

CARDIOVASCULAR

- Hypotension
- Orthostatic hypotension in ambulatory patients

CENTRAL NERVOUS SYSTEM

- Sedation (common)
- Light-headedness/dizziness
- Headache
- Insomnia
- Anxiety
- Confusion
- Euphoria/dysphoria
- Myoclonus
- Seizures

GASTROINTESTINAL (common)

- Nausea/vomiting
- Constipation. Diminished propulsive peristaltic waves in GI tract

RESPIRATORY

- Respiratory depression and apnea; may be severe, requiring maintenance of an adequate airway, use of resuscitative equipment, and administration of oxygen, naloxone, and/or other resuscitative drugs

MISCELLANEOUS

- Neonatal withdrawal syndrome: may be life-threatening. Signs and symptoms include irritability, hyperactivity, abnormal sleep pattern, high-pitched cry, tremor, vomiting, diarrhea, and failure to gain weight. Onset, duration, and severity depend on the drug used, duration of use, maternal dose, and rate of drug elimination by the newborn.

Dosing

ONLY for Palliative patients who are currently taking Hydromorphone that has been prescribed by a Physician or Nurse Practitioner.

*Optimal analgesic dose varies widely among patients; while doses should be titrated to pain management, consideration of sedation level and respiratory status will also guide dosing

Dilution:

- **Sub-Q** – none required
- **IV** – 9ml of NaCl which yields 0.2mg/ml

ADULT

PO

- 1mg q1hr PRN
- Frail/Reduced dose – 0.5mg q1hr PRN

Sub-Q/IV: Max dose is 2ml of volume at a single time

- 0.5mg q30mins PRN
- Frail/Reduced dose – 0.3mg q30mins PRN

PEDIATRIC

- Contact pediatric palliative patient's Physician for patient specific dosing.

NEONATE

- Not recommended due to potential central nervous system effects

Concentration Supplied:

- 2mg/1 ml (1ml amp)

RENAL IMPAIRMENT ADJUSTMENTS

- Initiate with 25% to 50% of the usual starting dose depending on the degree of impairment. Use with caution and monitor closely for respiratory and CNS depression

HEPATIC IMPAIRMENT ADJUSTMENTS

- Mild to severe impairment: Initiate with 25% to 50% of the usual starting dose depending on the degree of impairment
- Use with caution and monitor closely for respiratory and central nervous system depression

HEMO/PERITONEAL DIALYSIS/CRRT

- Hemodialysis: Unknown dialysability. 50% of normal dose. Administer anytime during dialysis
- CAPD: Unknown dialysability. 50% of usual starting dose and titrate according to response

MISCELLANEOUS

- Exact morphine to HYDROmorphone potency equivalence ratio is unclear
- Some suggest that 1.3 to 2 mg parenteral HYDROmorphone is equal to 10mg parenteral morphine

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** PO, SQ, IV

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/HYDROmorphone.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7053?cesid=1tiUreAYpt5&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DHYDROmorphone%26t%3Dname%26acs%3Dtrue%26acq%3Dhydro

Development – May, 2023
Update – July 31, 2023

Ibuprofen/Advil

Classification

- Analgesic, Non-opioid
- Nonsteroidal Anti-Inflammatory Drug (NSAID)

Indications

EMS INDICATIONS

- Management of inflammatory diseases and rheumatoid disorders
- Mild to moderate pain
- Fever
- Dysmenorrhea
- Osteoarthritis

SHA EMS Medical Direction Note:

- PO NSAID for use in patients less than 50 kg

HEALTH CANADA APPROVED

- *Management of inflammatory diseases and rheumatoid disorders*
- *Mild to moderate pain*
- *Fever*
- *Dysmenorrhea*
- *Osteoarthritis*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Abnormal uterine bleeding*
- *Gout, treatment acute flares*
- *Pericarditis, acute or recurrent*

Mechanism of Action

- The main mechanism of action of NSAIDs is the inhibition of the enzyme cyclooxygenase (COX). Cyclooxygenase is required to convert arachidonic acid into thromboxanes, prostaglandins, and prostacyclins. The therapeutic effects of NSAIDs are attributed to the lack of these eicosanoids.
- Has antipyretic, analgesic, and anti-inflammatory properties
- Other proposed mechanisms not fully elucidated (and possibly contributing to the anti-inflammatory effect to varying degrees), include inhibiting chemotaxis, altering lymphocyte activity, inhibiting neutrophil aggregation/activation, and decreasing proinflammatory cytokine levels.

Pharmacokinetics

- **Onset:** 30-60 minutes
- **Peak:** 1 hours
- **Duration:** 6-8 hours
- **Half-life:** 1.5 to 2 hours
- **Metabolized** through the liver via oxidation and **excreted** through the kidneys

Contraindications

- Hypersensitivity to Ibuprofen or other NSAIDS
- Cerebrovascular bleeding or other bleeding disorders
- Active gastric/duodenal/peptic ulcer, active GI bleeding
- Inflammatory bowel disease
- Uncontrolled heart failure
- Deteriorating renal disease
- Active hepatic disease
- Hyperkalemia
- Third trimester of pregnancy
- Systemic lupus erythematosus [oral formulation only];
- Children suffering from dehydration as a result of acute diarrhea, vomiting, or lack of fluid intake

Cautions

- Asthmatics (can precipitate bronchospasm)
- Active bleeding ulcers (risk vs benefit)
- Hepatic insufficiency
- Bleeding disorder
- Renal impairment. Use of ibuprofen lysine (NeoProfen) is contraindicated in preterm infants with significant renal impairment.
- May increase the risk of aseptic meningitis, especially in patients with systemic lupus erythematosus and mixed connective tissue disorders.

DRUG INTERACTIONS

- Aminoglycosides, caffeine, digoxin and vancomycin clearance may be reduced due to ibuprofen induced renal impairment. Carefully monitor drug levels and observe for signs of toxicity.
- Corticosteroids: Concomitant use may increase risk of intestinal perforation. Do not administer concurrently.

MONITORING

- CBC, chemistry profile, occult blood loss and periodic LFTs; monitor response (pain, range of motion, grip strength, mobility, ADL function), inflammation; observe for weight gain, edema; monitor renal function (urine output, serum BUN and creatinine); observe for bleeding, bruising (especially in patients with coagulation disorders or who are receiving anticoagulants); monitor for anemia with long-term therapy; evaluate GI effects (abdominal pain, bleeding, dyspepsia); mental confusion, disorientation; BP; periodic ophthalmic exams with long-term therapy; signs of infection (ibuprofen lysine); signs of immediate or delayed hypersensitivity reactions.

Adverse Effects

- Headache
- Heartburn
- Increased bleeding time
- Nausea
- Vomiting
- Rash

CENTRAL NERVOUS SYSTEM

- May cause drowsiness, dizziness, blurred vision, and other neurologic effects which may impair physical or mental abilities; patients must be cautioned about performing tasks which require mental alertness (eg, operating machinery or driving).

HYPERKALEMIA

- Nonsteroidal anti-inflammatory drug (NSAID) use may increase the risk of hyperkalemia, particularly in patients ≥65 years of age, in patients with diabetes or renal disease, and with concomitant use of other agents capable of inducing hyperkalemia (eg, ACE inhibitors). Monitor potassium closely.

OPHTHALMIC EVENTS

- Blurred/diminished vision, scotomata, and changes in color vision have been reported. Discontinue therapy and refer for ophthalmologic evaluation if symptoms occur. Periodically evaluate vision in all patients receiving long-term therapy.

Dosing

*Administer with food or milk to decrease GI upset.
** Oral suspension: Shake suspension well before use. Administer with an accurate measuring device (calibrated oral syringe or measuring cup); do not use a household teaspoon or tablespoon to measure dose (overdosage may occur).

ADULT/ELDERLY
More than 50KG

- **PO** Naproxen recommended

PEDIATRIC
6 Months to 12 years and Less than 50KG

- 10mg/kg **PO** q 6-8hrs

Concentration Supplied:

- 20mg/ml Suspension

Provider/Route:

- **EMR:** PO
- **PCP/ICP:** PO
- **ACP/CCP:** PO

Resources:

- SHA EMS Medical Director & Advisors
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7066?cesid=4Y4cOQfShGS&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dibuprofen%26t%3Dname%26acs%3Dtrue%26acq%3Dibu

Development – May 2023
Update - July 31, 2023

Ipratropium/Atrovent

Classification

- Anticholinergic

Indications

EMS INDICATIONS

- Patient experiencing bronchospasm
- COPD Acute exacerbation: Note: Although similar efficacy exists among formulations, some experts prefer nebulized therapy during severe chronic obstructive pulmonary disease (COPD) exacerbations. May be used in combination with an inhaled short-acting beta agonist
- Asthma, acute exacerbation, moderate to severe (off-label use): Note: May consider for treatment of moderate to severe exacerbations (eg, critically ill) in combination with a short-acting beta-adrenergic agonist. Nebulized therapy may be preferred in patients who have more severe symptoms or who cannot effectively use an inhaler

HEALTH CANADA APPROVED

- *Patient experiencing bronchospasm*
- *COPD Acute exacerbation: Note: Although similar efficacy exists among formulations, some experts prefer nebulized therapy during severe chronic obstructive pulmonary disease (COPD) exacerbations. May be used in combination with an inhaled short-acting beta agonist*

NON HEALTH CANADA APPROVED BUT SUBSTANTIATED IN LITURATURE

- *Asthma, acute exacerbation, moderate to severe (off-label use): Note: May consider for treatment of moderate to severe exacerbations (eg, critically ill) in combination with a short-acting beta-adrenergic agonist. Nebulized therapy may be preferred in patients who have more severe symptoms or who cannot effectively use an inhaler*

Mechanism of Action

- Blocks acetycholine at parasympathetic sites in bronchial smooth muscle causing bronchodilation
- Local application to nasal mucosa inhibits serous and seromucuous gland secretions

Pharmacokinetics

- **Onset:** within 15 minutes
- **Peak effect:** 1 to 2 hours
- **Duration:** 2 to 4 hours MDI, 4 to 8 hours NEB
- **Half-life:** 2 hours
- **Excretion:** Urine (50%)

Contraindications

- Hypersensitivity to ipratropium or atropine (and its derivatives)

Cautions

- Patients with narrow angle glaucoma should wear goggles
- Use caution in patients with myasthenia gravis
- Caution in patients with hypertrophic prostate, obstructed bladder neck
- Older adults may be more susceptible to the anticholinergic side effects of ipratropium (eg, dry eyes, dry mouth). The elderly may find it difficult to use the metered-dose inhaler. A spacer device may be useful. Monitor urinary function in elderly men with benign prostatic hyperplasia while on this medication.

PREGNANCY/BREASTFEEDING

- Systemic exposure following inhalation is negligible
- Systemic exposure following inhalation is negligible which would limit excretion into breast milk. According to the manufacturer, the decision to breastfeed during therapy should consider the risk of infant exposure, the benefits of breastfeeding to the infant, and the benefits of treatment to the mother.

Adverse Effects

- Headache
- Nausea
- Tremors
- Cough
- Dry mouth
- Bad taste
- Eye pain (can be severe) if given to glaucoma patient without goggles
- Pupil dilation
- Bronchospasm: Paradoxical bronchospasm that may be life-threatening and may occur with use of inhaled bronchodilating agents; this should be distinguished from inadequate response. If paradoxical bronchospasm occurs, discontinue ipratropium and institute alternative therapy.

CENTRAL NERVOUS SYSTEM

- dizziness and blurred vision; patients must be cautioned about performing tasks which require mental alertness (eg, operating machinery or driving).

HYPERSENSITIVITY REACTIONS

- urticaria, angioedema, rash, bronchospasm, oropharyngeal edema, including anaphylaxis, have been reported.
- Discontinue therapy immediately if patient develops an allergic reaction.

Dosing

ADULT/ELDERLY
NEBULIZED
- 250-500 mcg (usually repeated to max of 1 mg)

MDI WITH AERO CHAMBER
- 5 puffs @ 20 mcg/puff (no repeats) interspersed with Ventolin puffs (see below for instructions)

PEDIATRIC
NEBULIZED
- 125-250 mcg

MDI WITH AERO CHAMBER

Patients weighing more than 20 kg:
- 5 puffs @ 20 mcg (no repeats) interspersed with Ventolin puffs (see below for instructions)

Patients weighing less than 20 kg:
- 4 puffs @ 20 mcg (no repeats) interspersed with Ventolin puffs (see below for instructions)

Patients weighing less than 10 kg:
- MDI not indicated see above for nebulized dose

Dosing of Atrovent and Ventolin should look like this:
- 1 Ventolin puff at a time, waiting 30-60 seconds between up to 10 puffs.
- Follow each Ventolin with a puff of Atrovent 10 seconds post Ventolin puff for the first 5 puffs of Ventolin.
- *If the patient in extremis this wait time can be shortened as practitioner feels is appropriate*
- Wait 5 - 10 minutes between sets of 10 puffs Ventolin to observe for effect.
- Repeat sets of 10 puffs Ventolin up to 3 times (30 puffs)
- Atrovent *is only given during the first round of 10 puffs for 5 puffs. Repeat sets are* Ventolin *only*

Concentration Supplied:
- 250 mcg/mL Nebule; 20 mcg/puff MDI

Provider/Route:
- **EMR:** Not in scope of practice
- **PCP/ICP:** inhalation, nebulized
- **ACP/CCP:** inhalation, nebulized

Resources:
- SHA EMS Medical Director & Advisors
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1797824?cesid=53OLAE2pIEV&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dipratropium%26t%3Dname%26acs%3Dtrue%26acq%3Dipat

Development – May 2023
Update – July 31, 2023

Ketamine/Ketalar HIGH ALERT

Classification

- Anaesthetic – general

Indications

EMS INDICATIONS

- Induction and maintenance of anaesthesia
- Dissociative sedation prior to painful and frightening procedures
- Secondary medication for symptomatic relief of moderate to severe pain
- Secondary medication for symptomatic relief for severe agitation

SHA EMS Medical Direction Note:

- Not to be used for first line pain management or first line for severe agitation

HEALTH CANADA APPROVED

- *Induction and maintenance of anaesthesia*

NON HEALTH CANADA APPROVEINDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Dissociative sedation prior to painful and frightening procedures*
- *Symptomatic relief of moderate to severe pain*
- Adjunctive therapy for severe status asthmaticus, adjunctive 4th line therapy for refractory status epilepticus
- Adjunctive therapy for refractory status epilepticus after conventional therapies have failed
- Sedation/analgesia in mechanically ventilated patients in Critical Care
- Treatment resistant depression

Mechanism of Action

- Produces a cataleptic-like state in which the patient is dissociated from the surrounding environment by direct action on the cortex and limbic system. Ketamine is a non-competitive NMDA receptor antagonist that blocks glutamate

Pharmacokinetics

- **Onset:**
  - IV**:** ANESTHETIC EFFECT: Within 30 seconds
  - IM: ANESTHETIC EFFECT: 3 to 4 minutes; ANALGESIA: Within 10 to 15 minutes
  - IN: ANALGESIC EFFECT: Within 10 minutes; SEDATION: Children 2 to 6 years: 5 to 8 minutes
  - PO: ANALGESIA: Within 30 minutes
- **Peak**:
  - IM: 5 to 30 minutes
  - IN: ADULT 10 to 14 minutes; CHILDREN 2 TO 9 YEARS: ~20 minutes
  - PO: ~30 minutes

- **Duration:** 5-10 minutes IV ANESTHETIC EFFECT
- **Excretion:** Urine (91%); feces (3%)
- **Pharmacotherapy PEARLS:** The analgesia outlasts the general anesthetic component. Bronchodilation is beneficial in asthmatic or chronic obstructive pulmonary disease patients. Laryngeal reflexes may remain intact or may be obtunded. The direct myocardial depressant action of ketamine can be seen in stressed, catecholamine-deficient patients. Ketamine increases cerebral metabolism and cerebral blood flow while producing a noncompetitive block of the glutaminergic postsynaptic NMDA receptor.

Contraindications

- Hypersensitivity to ketamine or any component of the formulation
- Conditions where a significant elevation of blood pressure is hazardous (e.g. patients with poorly controlled hypertension, aneurysms, acute right- or left-sided heart failure, angina, recent myocardial infarction

Cautions

- **HIGH ALERT**
- Patients with mild-to-moderate hypertension, chronic congestive heart failure, tachyarrhythmias, or myocardial ischemia
- History of psychosis or substance use (schizophrenia, acute psychosis); increased incidence of emergence symptoms
- Age less than 3 months, due to an increased frequency of airway complication
- Acute intermittent porphyria, glaucoma or elevated intraocular pressure, globe injuries
- Hyperthyroidism or patients receiving thyroid replacement (increased risk of hypertension, tachycardia)
- Pulmonary or upper respiratory infection; ketamine sensitises the gag reflex, potentially causing laryngospasm
- Intracranial mass lesions, presence of head injury, hydrocephalus; may increase ICP

DRUG INTERACTIONS

- CNS depressants including benzodiazepines; will prolong recovery time and may increase risk of apnea

Adverse Effects

CARDIOVASCULAR

- Increased heart rate
- Elevated blood pressure. Elevation of BP begins shortly after injection, reaches a maximum within a few minutes and usually returns to baseline values within 15 minutes of injection
- Hypotension
- Arrhythmia
- Bradycardia

CENTRAL NERVOUS SYSTEM

- Elevation of intracranial and intraocular pressures

GASTROINTESTINAL

- Vomiting – occurs late in recovery phase

RESPIRATORY

- Moderate and transient (less than 30 seconds) respiratory depression
- Hypersalivation and increased tracheobronchial secretions
- Severe respiratory depression is associated with an over dosage or too rapid a rate of administration. Mechanical support of respiration is preferred to administration of analeptics

MISCELLANEOUS

- Emergence reaction; characterised by vivid dreams, dissociative or extracorporeal (out-of-body) experiences, floating sensations, hallucinations, delirium, confusion, or "weird trips". Generally subsides within a few hours. More common in those between 15 to 45 years of age, rapid IV administration and females. Pre-administration of a benzodiazepine may help to diminish incidence
- Self-limiting rash
- Random movement of head and extremities
- Rigidity
- Skeletal muscle hypertonicity

Dosing

ADULT/PEDIATRIC

PAIN

- 0.3 – 0.5mg/kg **IV** repeat q 10mins
- 1mg/kg **IN**

MFI

- 1.5 – 2mg/kg **IV** repeat in 3mins if needed

MFI MAINTENANCE

- 1mg/kg **IV** PRN

HYPOTENSIVE DOSING

- 0.25-1MG/KG **IV** repeat in 3mins if needed

SEVERELY AGITATED **ADULT ONLY**

- 3-4mg/kg **IM**

Concentration Supplied:

- 50mg/ml (10ml vial)

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IN, IV, IO, IVAD, monitor infusion

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/ketamine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7135?cesid=5IMuKI9FjMU&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dketamine%26t%3Dname%26acs%3Dtrue%26acq%3DkETAM

Development – May 08, 2023
Update – July 31, 2023

Ketorolac/Toradol

Classification

- Analgesic

Indications

EMS INDICATIONS

- For the short term management of moderate to severe pain

SHA EMS Medical Direction Note:

- For IM or IV use in patients that are unable to tolerate an oral NSAID

HEALTH CANADA APPROVED

- *IM use only, for the short term management of moderate to severe pain.Parenteral therapy should not exceed 2 days.*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN THE LITERATURE

- *IV use, for the short term management of moderate to severe pain*

Mechanism of Action

- Non-selective NSAID and acts by inhibiting both COX-1 and COX-2 enzymes which are normally responsible for converting arachidonic acid to prostaglandins
- Has antipyretic, analgesic, and anti-inflammatory properties

Pharmacokinetics

- **Onset:** 10 minutes IN/IV
- **Peak:** 1-2 hours IN/IV
- **Duration:** 6 hours or longer IN/IV
- **Metabolized** through glucuronidation and oxidation
- **Excretion:** Urine (92%, ~60% as unchanged drug); feces ~6%.

Contraindications

- Hypersensitivity to ketorolac, any component of formulation, ASA or other non-steroidal anti-inflammatory drugs (NSAID's)
- Active or history of peptic ulcer disease; recent or history of GI bleeding or perforation, inflammatory bowel disease; may increase risk of gastrointestinal irritation, inflammation, ulceration, bleeding, and perforation
- Suspected or confirmed cerebrovascular bleeding; hemorrhagic diathesis, incomplete hemostasis, or patient at high risk of bleeding; inhibits platelet function
- Patients with advanced renal disease or risk of renal failure due to volume depletion
- Severe hepatic impairment or active hepatic disease
- Prophylaxis before major surgery; perioperative pain in setting of coronary artery bypass graft (CABG) surgery; risk of MI and stroke may be increased with use following CABG surgery. Wound bleeding and postoperative hematomas have been associated with use in perioperative setting
- Labor and delivery; may inhibit uterine contractions and adversely affect fetal circulation

Cautions

- **ELDER ALERT**
- Elderly, frail, or debilitated patients: are more sensitive to adverse gastrointestinal and renal effects
- Sepsis, impaired renal function, heart failure and liver dysfunction: are more sensitive to adverse renal effects
- Cardiac decompensation, hypertension, or similar conditions; may cause fluid retention and edema

DRUG INTERACTIONS

- Salicylates, especially high dose regimes, may double plasma level of ketorolac; reduce dose of ketorolac by half
- Probenecid; decreases elimination of ketorolac, concomitant use is contraindicated by manufacturer
- Anticoagulants, heparin (including prophylactic low doses), thrombolytic agents, aspirin, other NSAID's, selective serotonin reuptake inhibitors; increased risk of bleeding
- High dose methotrexate (doses used in cancer therapy) may increase methotrexate levels and cause toxicity; monitor methotrexate levels i.e., longer leucovorin rescue may be required
- Lithium; may increase lithium plasma concentrations, monitor and adjust lithium dose as required
- Diuretics (e.g. furosemide), ACE inhibitors, cycloSPORINE; increase risk of renal impairment

PREGNANCY/BREAST FEEDING

- Maternal use of NSAIDs should be avoided beginning at 20 weeks' gestation.
- The manufacturer recommends that caution be used if administered to patients who are breastfeeding. Maternal use of NSAIDs should be avoided if the breastfeeding infant has platelet dysfunction, thrombocytopenia, or a ductal-dependent cardiac lesion. Agents other than ketorolac are preferred in breastfeeding patients at risk of hemorrhage.

Adverse Effects

GASTROINTESTINAL

- Nausea, vomiting
- Gastric mucosal injury, resulting in ulceration and bleeding, dose-dependent; risk may increase with doses over 20 mg

CENTRAL NERVOUS SYSTEM

- Somnolence
- Dizziness, headache, sweating

HAEMATOLOGICAL

- Prolonged bleeding time and decreased platelet aggregation. No significant effect on prothrombin, partial thromboplastin time or platelet count. Inhibition of platelet function is normalized within 24 to 48 hours after drug is discontinued

RENAL

- Dysuria, urinary retention, oliguria, increased urinary frequency, acute renal fail

Dosing

ADULT/ELDERLY
65 years or less:

- Initial Dose **IM/IV**:
  - 10mg (if supply is 10mg/1ml), then 10 mg every 4 to 6 hours.
  - 15mg (if supply is 30mg/1ml), then 15 mg every 4 to 6 hours.
  - Total daily dose not to exceed 120 mg

Greater than 65 Years/Less than 50KG:

- Initial Dose **IM/IV**:
  - 10 mg (if supply is 10mg/1ml), then lowest effective dose every 4 to 6 hours as required.
  - 15mg (if supply is 30mg/1ml), then lowest effective dose every 4 to 6 hours as required.
  - Total daily dose should not exceed 60 mg.

PEDIATRIC (Do not exceed 5 days of total therapy from all routes)
2- 16 years

- 0.2 to 0.5mg/kg **IM/IV** every 6 to 8 hours as required. Max 10 mg every 6 hours

NOTE: not recommended for children less than 2 years

Concentration Supplied:

- 30 mg/1 ml or 10mg/ml

Provider/Route:

- **EMR**: Not in scope of practice
- **PCP/ICP**: IM, IV
- **ACP/CCP**: IM, IV, IO, CVAD, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/ketorolac.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1797828?cesid=70pmMEjGBcI&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dketorolac%26t%3Dname%26acs%3Dtrue%26acq%3Dket
- SaskKids Pediatric Parental Manual
- Pedi STAT
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=b0066272-0c07-47b4-9b58-5b2829d27cfe%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535428&db=nup

Development – December 08, 2022
Update – July 31, 2023

Lidocaine HIGH ALERT/ELDER ALERT

Classification

- Anti-arrhythmic

Indications

EMS INDICATIONS

- Cardiac arrest, as per ACLS and PALS guidelines
- IO pain management for conscious patients
- Treatment of ventricular arrhythmias from myocardial infarction or cardiac manipulation (e.g. cardiac surgery)
- Treatment of stable VT
- Use as an aid in Endotracheal Intubation

SHA EMS Medical Direction Note:

- antiarrhythmic of choice for overdose in cases other than torsades

HEALTH CANADA APPROVED

- *Treatment of ventricular arrhythmias from myocardial infarction or cardiac manipulation (e.g. cardiac surgery)*

NON HEALTH CANADA APPROVED BUT SUBSTANTIATED IN THE LITERATURE

- *Cardiac arrest, as per ACLS and PALS guidelines*
- *IO pain management for conscious patients*
- *Post-operative pain; especially abdominal surgeries*
- *Refractory neonatal seizures*

Mechanism of Action

- Class Ib antiarrhythmic; suppresses automaticity of conduction tissue, by increasing electrical stimulation threshold of ventricle, His-Purkinje system, and spontaneous depolarization of the ventricles during diastole by a direct action on the tissues; blocks both the initiation and conduction of nerve impulses by decreasing the neuronal membrane's permeability to sodium ions, which results in inhibition of depolarization with resultant blockade of conduction

Pharmacokinetics

- **Onset:** 45 - 90 seconds IVP
- **Peak**: Immediate
- **Duration:** 10 - 20 minutes IVP up to several hours after continuous infusion
- **Half-life:** 1.5-2 hours IVP
- **Metabolized** 90% in the liver, **excreted** in urine.

Contraindications

- Hypersensitivity to morphine (rare), or any component of formulation (may contain sulfite preservatives) Cross reaction may occur with codeine, oxyCODONE, HYDROmorphone, oxyMORphone
- Cross reaction may occur with amide type local anaesthetics (e.g. bupivacaine, prilocaine, mepivacaine). Cross reaction has not been reported with procainamide or quiNIDine
- Adams-Stokes syndrome, Wolff-Parkinson-White syndrome, severe degrees of sinoatrial, atrioventricular or intraventricular block (except in patients with functioning artificial pacemaker)
- Supraventricular arrhythmias or severe myocardial depression
- Uncontrolled seizures

Cautions

- Elderly: may be a decreased clearance or increased half-life and increased risk for CNS and cardiac effects
- Use cardiac lidocaine only, i.e. preservative free and lacking EPINEPHrine
- Bradycardia, severe digitalis intoxication, 1st or 2nd degree heart block in the absence of pacemaker, hypokalemia, severe hypoxia or respiratory depression
- Conditions which decrease hepatic blood flow may lead to accumulation with continuous infusion e.g. heart failure, severe liver impairment, hypovolemia, shock

PREGNANCY/BREASTFEEDING

- Lidocaine and its metabolites cross the placenta and can be detected in the fetal circulation following maternal injection for anesthesia prior to delivery.
- Adverse reactions in the fetus/neonate may affect the CNS, heart, or peripheral vascular tone. Fetal heart monitoring is recommended by the manufacturer.
- Medications used for the treatment of cardiac arrest in pregnancy are the same as in the nonpregnant woman. Doses and indications should follow current Advanced Cardiovascular Life Support guidelines. Appropriate medications should not be withheld due to concerns of fetal teratogenicity.
- Available guidelines consider lidocaine to be compatible with breastfeeding when used as an antiarrhythmic or local anesthetic.

REQUIREMENTS

- Electronic infusion device for maintenance infusion

MONITORING REQUIRED

DIRECT IV AND CONTINUOUS INFUSION

- Continuous ECG monitoring during administration and until stable
- Notify physician if there is a prolongation of PR interval and QRS complex

INTERMITTENT INFUSION

- Baseline BP, HR and CNS toxicity; then every 10 minutes during infusion, then every 15 minutes x 2
- Potential signs of CNS toxicity; ringing in ears, circumoral numbness, metallic taste, nausea, dizziness, sedation

Adverse Effects

LOCAL ANESTHETIC SYSTEMIC TOXICITY (LAST) presents with both central nervous system and cardiovascular symptoms

TOXICITY EARLY SIGNS

- Tinnitus, metallic taste, circumoral numbness, drowsiness, dizziness, confusion, visual disturbances, behavior changes, myoclonus, tremors, irritability

LATE SIGNS

- Restlessness, seizures, cardiac dysrhythmias, cardiac arrest

CARDIOVASCULAR

- Hypotension
- Myocardial depression (prolongation of PR interval and QRS complex)
- Bradycardia
- Heart block
- Ventricular arrhythmias
- Cardiac arrest
- Edema

CENTRAL NERVOUS SYSTEM

- Restlessness
- Nervousness
- Tremors/shivering
- Drowsiness
- Slurred speech
- Unrest/nervousness
- Facial twitching
- Perspiration
- Seizures
- Dizziness
- Blurred vision

GASTROINTESTINAL

- Vomitting

RESPIRATORY

- Dyspnea and
- Apnea

MISCELLANEOUS

- Urticaria
- Tinnitus
- Chills

Dosing

ADULT IO INSERTION PAIN CONTROL

- 0.5mg/kg **IO** (max 40mg)

PEDIATRIC IO INSERTION PAIN CONTROL

- 0.5mg/kg **IO** (max 20mg)

VF/PULSELESS VT/VT/WIDE QRS

- 1-1.5mg/kg **IVP repeat** 0.5mg – 0.75mg/kg **IVP** (max 3mg/kg) q 5-10minutes

PEDIATRIC VT/WIDE QRS

- 1mg/kg **IVP** (max 3mg/kg)

MAINTENANCE INFUSION

- 1-4mg/min **IV infusion via pump** (30-50mcg/kg/min)(15-60mls/hr)

HEPATIC IMPAIRMENT ADJUSTMENTS

- Reduce maintenance infusion
- Initial **IV infusion via pump**: 0.75 mg/minute or 10 mcg/kg/minute
- Maximum dose **IV infusion via pump**: 1.5 mg/minute or 20 mcg/kg/minute

MISCELLANEOUS

- **Endotracheal** use for cardiac arrest: 2 to 4mg/kg **ETT** (2 to 2.5 times the IV dose) Dilute in NaCl or SWFI, absorption greater with sterile water and results in less impairment of PaO2

LIDOCAINE INTUBATION SPRAY

- Spray until vocal cords and surrounding tissues are coated
- Respiratory tract: 50 to 400 mg (maximum dose: 400 mg for procedure less than 1 minute or 600 mg for procedure greater than 5 minutes).
- Trachea, larynx, bronchi: 50 to 200 mg (maximum dose: 200 mg for procedure less than 1 minute or 400 mg for procedure greater than 5 minutes).
- Topical: Local anesthetic for mucous membrane of the oropharynx; lubricant for intubation;
- Oral topical endotracheal solution, metered-dose spray (10 mg/actuation) [Canadian product]: Attach nozzle and prime pump 5 to 10 times prior to first use; prime ~2 times (to remove air) when switching to a new nozzle. Product should be in upright position while spraying. Do not modify manufacturer supplied nozzle. Discard nozzle after use (do not reuse). Do not use on cuffs or endotracheal tubes made of plastic (may damage cuff).
- Topical oral solution/viscous: When used in mouth or throat, topical anesthesia may impair swallowing and increase aspiration risk. Avoid food for ≥60 minutes following oral or throat application. This is especially important in the pediatric population. Numbness may increase the danger of tongue/buccal biting trauma; ingesting food or chewing gum should be avoided while mouth or throat is anesthetized. Excessive doses or frequent application may result in high plasma levels and serious adverse effects; strictly adhere to dosing instructions. Use measuring devices to measure the correct volume, if applicable, to ensure accuracy of dose.
- Onset Topical: 3 to 5 minutes;
- Dose varies with area of application (be sure to add amount used into the total drug maximum)

Concentration Supplied:

- **IV** 20mg/ml (5ml Preload)
- **IV infusion:** 1000 mg in 250 mL (concentration: 4 mg/mL)
- **Spray (non aerosol topical anesthetic)** 12mg/dose (equivalent up to 10mg) (250metered doses/30mls)

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO, Spray, Infusion

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/lidocaine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1797832?cesid=avspZeRibhs&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dlidocaine%26t%3Dname%26acs%3Dtrue%26acq%3Dlid

Development – May 08, 2023
Update – July 31, 2023

LORazepam HIGH ALERT/ELDER ALERT

Classification

- Benzodiazepine

Indications

EMS INDICATIONS

- To produce sedation, anterograde amnesia and relief of anxiety

HEALTH CANADA APPROVED

- *To produce sedation, anterograde amnesia and relief of anxiety*
- *Seizures*

NON HEALTH CANADA APPROVED INDICATION BUT SUSTANTIATED IN LITURATURE

- *Akathisia, antipsychotic-induced*
- *Catatonia*
- *Chemotherapy-induced nausea and vomiting, prevention and treatment*
- *Intoxication*
- *Mechanically ventilated patients in the ICU, sedation*
- *Neuroleptic malignant syndrome*
- *Serotonin syndrome*
- *Substance withdrawal*
- *Treatment of acute alcohol withdrawal*

Mechanism of Action

- Short-to-intermediate-acting benzodiazepine (based on half-life) (Griffin 2013). Binds to stereospecific benzodiazepine receptors on the postsynaptic GABA neuron at several sites within the central nervous system, including the limbic system, reticular formation. Enhancement of the inhibitory effect of GABA on neuronal excitability results by increased neuronal membrane permeability to chloride ions. This shift in chloride ions results in hyperpolarization (a less excitable state) and stabilization. Benzodiazepine receptors and effects appear to be linked to the GABA-A receptors. Benzodiazepines do not bind to GABA-B receptors.

Pharmacokinetics

- **Onset:** 15 - 60minutes PO
- **Peak:** 1 - 6hours PO
- **Duration:** 8 - 12hours PO

Contraindications

- Hypersensitivity to LORazepam, other benzodiazepines, or any component of formulation
- Untreated acute narrow-angle glaucoma, severe respiratory insufficiency (except during mechanical ventilation)
- Myasthenia gravis: listed as a contraindication by manufacturer

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly: more sensitive to therapeutic and adverse effects (e.g. ataxia, dizziness, over sedation)
- Debilitated patients and those with limited pulmonary reserve (e.g. COPD, sleep apnea syndrome) and the very young

DRUG INTERACTIONS

- Additive CNS effects with phenothiazines, narcotic analgesics, barbiturates, alcohol, antidepressants, scopolamine, and MAO inhibitors

PREGNANCY/BREASTFEEDING

- In utero exposure to benzodiazepines has the potential to cause harm to the fetus.
- Breastfeeding during benzodiazepine therapy is not recommended due to the potential for drowsiness in the breastfeeding infant.

Adverse Effects

CENTRAL NERVOUS SYSTEM

- Drowsiness and excessive sedation, especially in patients over 50 years. Can be rapidly reversed by flumazenil IV if treatment required
- Vertigo, weakness and unsteadiness
- Restlessness, confusion, depression, delirium, hallucinations, diplopia, amnesia

CARDIOVASCULAR

- Hypotension

RESPIRATORY

- Respiratory depression and partial airway obstruction

MISCELLANOUS

- Pain at injection site and erythema.

Dosing

ADULT/GREATER THAN 12 YEARS

- LESS THAN 50kg – 1mg **SL**
- GREATER THAN 50kg – 1 -2mg **SL**

Concentration Supplied:

- 1mg tab

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP:** Not in scope of practice
- **ICP:** SL with Med Control
- **ACP/CCP:** SL

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/LORazepam.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7195?cesid=1Pd7dYit7KJ&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DLORazepam%26t%3Dname%26acs%3Dtrue%26acq%3Dlor
- https://web.s.ebscohost.com/nup/detail/detail?vid=6&sid=375b2d26-920e-4610-bd42-15550e019a1a%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535566&db=nup
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Development – May, 2023
Update - July 31, 2023

Magnesium Sulfate HIGH ALERT

Classification

- Electrolyte, Anticonvulsant, Smooth muscle relaxant

Indications

EMS INDICATIONS

- Treatment of hypomagnesemia
- As a CNS depressant, primarily in preeclampsia and eclampsia of pregnancy
- Torsades de pointes or VF/pulseless VT associated with torsades de pointes
- Adjunctive therapy for moderate to severe reactive airway disease exacerbation
- As a CNS depressant, primarily in preeclampsia and eclampsia of pregnancy

HEALTH CANADA APPROVED

- *Treatment of hypomagnesemia*
- *As a CNS depressant, primarily in preeclampsia and eclampsia of pregnancy*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Torsades de pointes or VF/pulseless VT associated with torsades de pointes*
- *Adjunctive therapy for moderate to severe reactive airway disease exacerbation*
- *Fetal neuroprotection of the preterm infant*

Mechanism of Action

- Decreases acetylcholine in motor nerve terminals and acts on myocardium by slowing rate of S-A node impulse formation and prolonging conduction time. Magnesium is necessary for the movement of calcium, sodium, and potassium in and out of cells, as well as stabilizing excitable membranes.
- Intravenous magnesium may improve pulmonary function in patients with asthma; causes relaxation of bronchial smooth muscle independent of serum magnesium concentration.

Pharmacokinetics

- **Onset:** Immediate
- **Peak**: unknown
- **Duration:** 30minutes
- **Metabolized** 90% in the liver, **excreted** in urine.

Contraindications

- Hypersensitivity to magnesium sulfate or any component of formulation
- Heart block, myocardial damage
- Renal Failure

Cautions

- **HIGH ALERT**
- Elderly or patients with renal impairment: excreted renally
- Neuromuscular disease: use with extreme caution those with myasthenia gravis or other neuromuscular disease
- Ordering of dosage and labelling of vials may be in grams, milliequivalents or millimoles. Check carefully

DRUG INTERACTIONS

- Non-depolarising muscle relaxants - potentiation of relaxant effect
- Gentamicin - respiratory arrest in unventilated newborn exposed to magnesium sulfate immediately before birth

PREGNANCY/BREASTFEEDING

- Contact pharmacy or specialised on-line references for most recent information

REQUIREMENTS

- Electronic infusion device Monitor for hypersensitivity reaction(s)

MONITORING REQUIRED

DIRECT IV

- HR and ECG monitoring as per ACLS protocol

INFUSIONS: WHEN INFUSION RATES ARE GREATER THAN 2 GRAMS PER HOUR

- Baseline: BP, HR, RR, bilateral deep tendon reflexes (optional when used for control of tetany spasms), and level of consciousness
- Respirations every 1 hour
- Bilateral deep tendon reflexes every 1 hour or continuous BP and ECG monitoring when used for control of tetany spasms
- Fluid balance every 1 to 4 hours or as ordered by physician
  - **Adults:** notify physician if RR less than 12 per minute, or if urine output less than 120 mL in 4 hours
  - **Pediatrics:** notify physician if RR decreases by 20% of baseline or urine output less than 2 mL/kg/hour, monitor serum urinary magnesium levels, other electrolytes (calcium, potassium, phosphorus) and renal function periodically

OBSTETRICS

- Baseline: BP, HR, RR, bilateral deep tendon reflexes, and level of consciousness; and fetal heart rate
- BP and HR every 15 minutes for a minimum of 4 hours until stabilized, then every 30 minutes
- Continuous pulse oximetry – notify physician if O2 saturation is less than 95%
- Respirations and urine output every 1 hour - notify physician if RR less than 12 per minute, or if urine output less than 120 mL in 4 hours
- Bilateral deep tendon reflexes and level of consciousness
- Continuously monitor fetal heart rate

PEDIATRICS

- HR and rhythm, BP, RR at baseline and q15 minutes times two
- Monitor urinary out-put
- Notify physician if RR decreases by 20% or if urine output is less than 2 mL/kg/hr
- Serum magnesium post dose
- Calcium, potassium, phosphorus and renal function periodically

RECOMMENDED

- Baseline Ca and Mg serum levels: repeat levels as indicated by clinical condition

Adverse Effects

*Related to serum level: Important adverse effects may occur within therapeutic range

SERUM LEVEL approximately 2 to 3 mmol/L:

- Lethargy
- Drowsiness
- Flushing
- Nausea/vomiting
- Diminished deep tendon reflex

SERUM LEVEL approximately 3 to 5 mmol/L:

- Somnolence
- Loss of deep tendon reflexes
- Hypotension
- Bradycardia
- Prolonged PR interval
- Prolonged QRS interval

SERUM LEVEL approximately GREATER THAN 5 mmol/L:

- Respiratory paralysis
- Paralysis
- Refractory hypotension
- AV block
- Cardiac arrest
- Coma
- Death
- Respiratory support, followed by intravenous calcium, is given in magnesium overdose

Dosing

*When IV magnesium is given, an abrupt but temporary elevation in plasma magnesium concentration will partially inhibit stimulus to magnesium reabsorption
*Up to 50% of infused magnesium will be excreted in urine
*Magnesium uptake by cells is slow and so adequate repletion requires sustained correction of hypomagnesemia

ADULT

ECLAMPSIA

- 4g in 100ml NaCL **infused IV via pump** over 30minutes

SEVERE BRONCHOCONSTRICTION OR BRONCHOSPASM

- 1-2g in 50ml NaCl **infused IV via pump** over 20minutes

CARDIAC ARREST (DUE TO HYPOMAGNESEMIA OR TORSADES DE POINTES)

- 1-2g **IVP** diluted in 10mls NaCl

CARDIAC ARREST REFRACTORY VFIB/VT (SUSPECTED TORSADES DE POINTES)

- 1-2g **IVP** diluted in 10mls NaCl (After max Amio/Lido has been given)

PERFUSING POLYMORPHIC VT (TORSADES DE POINTES)

- 1-2g in 50ml NaCl **infused IV via pump** over 15minutes

PEDIATRIC

SEVERE BRONCHOCONSTRICTION OR BRONCHOSPASM

- 25-50mg/kg (max 2g) in 50ml NaCl **infused IV via pump** over 20minutes

RENAL IMPAIRMENT ADJUSTMENTS

- Hypomagnesemia: reduce dose by 50%. Use with caution; monitor for hypermagnesemia

Concentration Supplied:

- 20% 200mg/ml (10ml vial)

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO, CVAD, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/magnesium%20sulfate.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7216?cesid=1RBLtoHYuEY&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dmagnesium%2Bsulfate%26t%3Dname%26acs%3Dtrue%26acq%3Dmag
- https://web.s.ebscohost.com/nup/detail/detail?vid=8&sid=375b2d26-920e-4610-bd42-15550e019a1a%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009958737&db=nup

Development – May, 2023
Update – July 31, 2023

MethylPREDNISolone/Solumedrol

Classification

- Glucocorticoid - anti-inflammatory

Indications

EMS INDICATIONS

- Adjunctive treatment for anaphylaxis, bronchospasm secondary to asthma, COPD, croup in adults.

HEALTH CANADA APPROVED

- *Treatment of a wide variety of diseases and conditions principally for its effects as an anti-inflammatory and immunosuppressant agent and for its effects on blood and lymphatic systems in the palliative treatment of various disease*
- *Adjunctive treatment for anaphylaxis, croup and bronchospasm secondary to asthma or COPD.*

Mechanism of Action

- Corticosteroids exert a wide array of physiologic effects including modulation of carbohydrate, protein, and lipid metabolism and maintenance of fluid and electrolyte homeostasis. Moreover cardiovascular, immunologic, musculoskeletal, endocrine, and neurologic physiology are influenced by corticosteroids. Decreases inflammation by suppression of migration of polymorphonuclear leukocytes and reversal of increased capillary permeability.

Pharmacokinetics

- **Onset:** Rapid
- **Peak:** Unknown
- **Duration:** Unknown
- **Metabolism:** Hepatic to metabolites
- **Excretion:** Urine (1.3% [oral], 9.2% [IV succinate] as unchanged drug)

Contraindications

- Hypersensitivity to methylPREDNISolone or any component of the formulation, or any other corticosteroid. Cross hypersensitivity may occur
- Inactive and active tuberculosis, herpes simplex keratitis, vaccinia, varicella, systemic fungal infections
- Acute psychoses
- Cushing's syndrome

Cautions

- Avoid rapid infusion of large doses (i.e. greater than 500 mg over less than 10 minutes), as cardiac arrhythmias, circulatory collapse and cardiac arrest have been reported
- In patients with diabetes, osteoporosis, renal insufficiency, chronic psychosis, diverticulitis, peptic ulcer, hypertension
- May affect growth velocity in the pediatric population

DRUG INTERACTIONS

- Rifampin, phenobarbital and phenytoin - increase methylPREDNISolone metabolism
- Antifungals, grapefruit and protease inhibitors – decrease methylPREDNISolone metabolism
- May increase toxic effects of live vaccines and diminish the effects of all vaccines

PREGNANCY/BREASTFEEDING

- Consult pharmacy or specialised on-line references for most recent information
- If there is concern about exposure to the infant, waiting 2 to 4 hours after administration of methylprednisolone IV decreases exposure via breast milk

REQUIREMENTS

- Electronic IV Infusion Device

MONITORING REQUIRED DURING INTERMITTENT INFUSION OF DOSES OVER 500 mg
FOR INITIAL DOSE ONLY

- Baseline BP and heart rate, and every 15 minutes x 1, then repeat 15 minutes after end of infusion and until stable

PEDIATRIC PULSE THERAPY

- Vital signs every 15 minutes during infusion and 60 minutes post infusion if BP is stable
- Contact most responsible physician if systolic BP increases by 15 mm Hg over baseline, diastolic BP increases by 10 mm Hg over baseline, or if HR increases by 15 beats per minute over baseline

RECOMMENDED

- Baseline serum potassium for doses of 1 gram or greater

Adverse Effects

Occur with use of high doses for prolonged periods
Less likely to occur with short term use

CARDIOVASCULAR

- Hypotension
- Hypertension
- Bradycardia
- Cardiac arrest
- Arrhythmias

GASTROINTESTINAL

- Peptic ulcer
- Nausea/vomiting
- Altered taste

HEMATOLOGIC

- Sodium and fluid retention
- Potassium loss
- Diuresis
- Carbohydrate intolerance
- Manifestations of latent diabetes mellitus
- Increased requirements for insulin or oral hypoglycemics

RESPIRATORY

- Bronchospasm
- Anaphylaxis

MISCELLANEOUS

- Impaired wound healing
- Petechiae
- Ecchymosis

Dosing

DOSE

- 1mg/kg (max 125mg) in 50ml NaCl **infused IV via pump** over 20minutes
    - Can also be administered direct **SIVP** over at least 2 to 3 minutes

RENAL IMPAIRMENT ADJUSTMENTS

- No change required. May aggravate azotemia, sodium and fluid retention, glucose intolerance and hypertension

HEMO/PERITONEAL DIALYSIS

- Hemodialysis: administer dose post hemodialysis

MISCELLANEOUS

- Can be given IM
- If used for only brief periods (a few days) in emergency situations, may reduce and discontinue dosage quite rapidly

Concentration Supplied:

- 125mg vial (see vial/package insert for reconstitution instructions)

RECONSTITUTION

- Type and volume of diluent required may vary with brand. See vial/package insert for reconstitution instructions
- If using Act-O-Vial, use supplied diluent
- For Teva Brand see Appendix A for dilution

COMPATIBILITY/STABILITY

- Stable in D5W, NS or D5-1/2S at concentrations of 0.25 mg/mL or greater for at least 24 hours at room temperature
- Compatible with D5NS and Lactate Ringer's solutions
- Compatibility and stability of methylPREDNISolone in solutions and with other drugs in intravenous admixtures is dependent on admixture pH, concentration, time, temperature, and the ability of methylPREDNISolone to solubilise itself Whenever possible it is recommended that methylPREDNISolone be administered separate from other drugs

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IV, IO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/methylPREDNISolone.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7282?cesid=4DkCyNGBL1T&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3DmethylPREDNISolone%26t%3Dname%26acs%3Dtrue%26acq%3Dmeth
- https://web.s.ebscohost.com/nup/detail/detail?vid=3&sid=47472737-1695-40a9-9225-50e67c7719ff%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565363&db=nup

Development – May, 2023
Update – July 31, 2023

Midazolam HIGH ALERT/ELDER ALERT

Classification

- Benzodiazepine/Sedative

Indications

EMS INDICATIONS

- For sedation/amnesia prior to and during direct current cardioversion
- Induction and maintenance of anesthesia; sedation in MFI
- Seizure control
- Pain control refractory to analgesic
- Moderate to severe agitation/anxiety

SHA EMS Medical Direction Note:

- Frail elderly max of 5mg

*EMS INDICATIONS FOR **PALLIATIVE** USE UPON COMPLETING PALLIATIVE TRAINING*

- *For Restlessness in the **Palliative patient** only when Haloperidol is not effective as the first line treatment. If the palliative patient is violent and a danger to themselves or others, use midazolam first then follow with Haloperidol once under control and if delirium persists.*
- *For Muscle Relaxant in the **Palliative patient***

HEALTH CANADA APPROVED

- *For sedation/amnesia prior to and during direct current cardioversion*
- *Induction and maintenance of anesthesia; sedation in MFI*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Seizure control*
- *Refractory status epilepticus*
- *Pain control refractory to analgesic*
- *Moderate to severe agitation/anxiety*

Mechanism of Action

- Binds to stereospecific benzodiazepine receptors on the postsynaptic GABA neuron at several sites within the central nervous system. Enhancement of the inhibitory effect of GABA on neuronal excitability results by increased neuronal membrane permeability to chloride ions. This shift in chloride ions results in hyperpolarization (a less excitable state) and stabilization.

Pharmacokinetics

- **Onset:** 1.5 to 5minutes IV, 15minutes IM, 5minutes IN
- **Peak:** Rapid IV, 30-60minutes IM, 10minutes IN
- **Duration:** 2-6hours IV,IM, 30-60minutes IN
- **Metabolism:** Extensively hepatic via CYP3A4; 60% to 70% of biotransformed midazolam is the active metabolite 1-hydroxy-midazolam (or alpha-hydroxymidazolam)
- **Excretion:** Urine (primarily as glucuronide conjugates of the hydroxylated metabolites); IV, IM: Urine (primarily as metabolites)

Contraindications

- Hypersensitivity to midazolam, any component of the formulation or other benzodiazepines
- Acute pulmonary insufficiency or severe COPD, acute narrow angle glaucoma
- Outside of ICU setting: shock, coma, myasthenia gravis or severe depression of vital signs

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly, obese or debilitated patient, those with COPD, an impaired gag reflex, heart failure, renal failure or severe alcoholic cirrhosis: decreased dose required
- Neonates: avoid rapid IV injection: severe hypotension and seizures have been reported; risk may be increased with concomitant fentaNYL use

DRUG INTERACTIONS

- CNS depressants including narcotics, barbiturates and alcohol; may enhance hypnotic effect and increase risk of apnea
- Is a substrate of cytochrome P450 3A4 (major); Interacts with many drugs - contact pharmacy for more information. Review drug profile at time of initiation and with any change in medication regimen

PREGNANCY/BREASTFEEDING

- Contact pharmacy or specialized online references for most recent information
- In utero exposure to benzodiazepines has the potential to cause harm to the fetus. Teratogenic effects have been observed in some studies; however, a clear association has not been reported and additional data are needed. Exposure to a benzodiazepine late in pregnancy may cause neonatal sedation (hypotonia, lethargy, respiratory depression) and/or symptoms of neonatal withdrawal (feeding difficulties, hyperreflexia, inconsolable crying, irritability, restlessness, tremors). Data related to long-term effects on neurodevelopment are inconclusive. Newborns exposed to midazolam in utero should be monitored for feeding problems, respiratory depression, sedation, and withdrawal.
- Breastfeeding during benzodiazepine therapy is not recommended due to the potential for drowsiness in the breastfeeding infant. According to the manufacturer, the decision to breastfeed during therapy should consider the risk of infant exposure, the benefits of breastfeeding to the infant, and the benefits of treatment to the mother. Infants exposed to oxazepam via breast milk should be monitored for feeding problems, respiratory depression, and poor weight gain.

MONITORING REQUIRED

- Monitor for hypersensitivity reaction(s)

DIRECT IV

- Baseline BP, HR and RR and O2. Repeat every 5 minutes x 3 and until stable, then every 15 minutes x 3

*ANTIDOTE

- Effects can be reversed by flumazenil

Adverse Effects

CARDIOVASCULAR

- Decreased/increased mean arterial pressure
- Increased/decreased pulse rate
- Hypotension

CENTRAL NERVOUS SYSTEM

- Headache
- Drowsiness
- Excessive sedation
- Dizziness
- Paradoxical reactions in children (e.g., agitation, restlessness, combativeness)

GASTROINTESTINAL

- Nausea/vomiting

RESPIRATORY

- Decreased respiratory rate/tachypnea
- Apnea
- Respiratory depression
- Airway obstruction
- Respiratory arrest

Dosing

ADULT

SEIZURE

- 10mg **IM**
- 2.5mg **IV** max 10mg q 2min
- 10mg **IN** (5mg/ml in each nare)

MODERATE AGITATION/ANXIETY

- 2.5 – 5mg **IM** q 10minutes; 2mg **IV** q 5min

SEVERELY AGITATED (14 – 60 YEARS)

- 2 – 10mg **IM** q 10minutes; 2mg **IV** q5min (max 20mg)

MFI:

- 0.1mg/kg **IV** (max single dose 5mg) repeat as needed to max dose of 10mg

MFI MAINTENANCE

- 1 – 2.5mg **IV**

PAIN:

- 0.05mg/kg **IV** q 10minutes PRN

CARDIOVERSION

- 2 – 5mg **IV** repeat at 1mg to max 5mg

ELDERLY

- Same dosing as adult but **Frail Elderly** to a **max of 5mg**

PEDIATRIC

SEIZURE

- 0.2mg/kg **IM**; 0.1mg/kg **IV**; 0.2mg/kg **IN** max 10mg q 10minutes

MFI

- 0.05 - 0.1mg/kg **IVP** (max 5mg)

MFI MAINTENANCE

- 0.05mg/kg **IVP**

Palliative Patient

Restlessness (adult)

- *5mg **SQ** q30mins PRN (if haloperidol is not adequate or patient is violent or a danger to themselves or others)* ****should not be used as first line treatment in delirium or restlessness as benzodiazepines can worsen the delirium state.***

Seizures (adult)

- *5mg **SQ** q5mins until seizure is controlled.*

RENAL IMPAIRMENT ADJUSTMENTS

- Bolus dosing: use sparingly and titrate according to response

HEPATIC IMPAIRMENT ADJUSTMENTS

- Single dose (e.g. induction): No dosage adjustment recommended; may be more sensitive to effects; anticipate longer duration of action
- Multiple dosing or continuous infusion: Expect longer duration of action and accumulation; based on patient response, dosage reduction likely to be necessary

Concentration Supplied:

- 5mg/1 ml (2ml vial)

Provider/Route:
MISCELLANEOUS

- Can be administered IM and subcutaneously
- Intranasal administration has been used; due to low pH burning upon administration is likely
- **EMR:** Not in scope of practice
- **PCP:** Not is scope of practice
- **ICP:** IM, IV, IN for seizure; **MED CONTROL** for agitation/anxiety
- **ACP/CCP:** IM, IV, IO, IN

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/midazolam.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7296?cesid=2iVc91wl7st&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dmidazolam%26t%3Dname%26acs%3Dtrue%26acq%3Dmidaz
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=b24815b0-0f6e-4894-a107-a7005ff433bf%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535711&db=nup
- *Palliative Program (2021)*

Development – May, 2023
Update – July 31, 2023

Morphine HIGH ALERT/ELDER ALERT

Classification

- Opiate Agonist/Narcotic Analgesic

Indications

EMS INDICATIONS

- Severe acute or chronic pain.
- Indicated exclusively for symptomatic relief of moderate to severe pain

*EMS INDICATIONS FOR **PALLIATIVE** USE UPON COMPLETING PALLIATIVE TRAINING*

- ***Palliative patients** for pain management and breathlessness with palliative training*

HEALTH CANADA APPROVED

- *Severe acute or chronic pain.*
- *Indicated exclusively for symptomatic relief of moderate to severe pain*

Mechanism of Action

- Binds to opioid receptors in the CNS, causing inhibition of ascending pain pathways, altering the perception of and response to pain; produces generalized CNS depression

Pharmacokinetics

- **Onset:** Rapid IV**,** 10-30minutes IM, 20minutes SQ
- **Peak:** 20minutes IV, 30 to 60minutes IM, 50-90minutes SQ
- **Duration:** 4 to 5hours IV/IM/SQ (Patient dependent)
- **Metabolism and Excretion:** Mostly metabolized by the liver. Active metabolites excreted renally.

Contraindications

- Hypersensitivity to morphine (rare), or any component of formulation (may contain sulfite preservatives) Cross reaction may occur with codeine, oxyCODONE, HYDROmorphone, oxyMORphone

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly: May be more sensitive to adverse effects, including life-threatening respiratory depression. Decrease initial dose. In setting of chronic pain, monitor closely due to an increased potential for risks, including certain risks such as falls/fracture, cognitive impairment, and constipation. Clearance may also be reduced in older adults (with or without renal impairment) resulting in a narrow therapeutic window and increasing risk for respiratory depression or overdose

- Cachectic or debilitated patients: Is a greater potential for critical respiratory depression, even at therapeutic dosages
- Respiratory disease: Monitor for respiratory depression in patients with significant chronic obstructive pulmonary disease or cor pulmonale and patients having a substantially decreased respiratory reserve, hypoxia, hypercarbia, or preexisting respiratory depression, particularly when initiating therapy and titrating therapy; critical respiratory depression may occur, even at therapeutic dosages
- Sleep-disordered breathing: Use with caution for chronic pain and titrate dosage cautiously in patients with risk factors for sleep-disordered breathing, including HF and obesity
- Hypovolemia, cardiovascular disease (including acute MI), circulatory shock: Potential vasodilation + hypotension
- Head trauma, intracranial lesions, or elevated intracranial pressure: Respiratory depressant effects (with CO2 retention and secondary elevation of CSF pressure) may be markedly exaggerated
- CNS depression/coma: Are susceptible to intracranial effects of CO2 retention
- Abdominal conditions: May obscure diagnosis or clinical course
- Adrenocortical insufficiency: including Addison disease. Long-term opioid use may cause secondary hypogonadism
- Biliary tract dysfunction or acute pancreatitis: May cause constriction of sphincter of Oddi
- Delirium tremens, hepatic or renal impairment, obesity, prostatic hyperplasia/urinary stricture, psychosis, thyroid dysfunction. Seizure disorders: May cause or exacerbate pre-existing seizures
- Patients on opioids for chronic pain, with opioid use disorder or on opioid agonist therapy – may require consultation to specialist (e.g. anesthesiology, addictions medicine)

DRUG INTERACTIONS

- Benzodiazepines or other CNS depressants: May result in profound sedation, respiratory depression, coma, and death
- Other potentially significant interactions may exist, requiring dose or frequency adjustment, additional monitoring, and/or selection of alternative therapy. Consult drug interactions database for more detailed information

PREGNANCY/BREASTFEEDING

- Consult pharmacy or specialised on-line references for most recent information
- According to some studies, maternal use of opioids may be associated with birth defects (including neural tube defects, congenital heart defects, and gastroschisis), poor fetal growth, stillbirth, and preterm delivery. Opioids used as part of obstetric analgesia/anesthesia during labor and delivery may temporarily affect the fetal heart rate.
- **[US Boxed Warning]: Prolonged use of morphine during pregnancy can result in neonatal opioid withdrawal syndrome, which may be life-threatening if not recognized and treated, and requires management according to protocols developed by neonatology experts. If opioid use is required for a prolonged period in a pregnant woman, advise the patient of the risk of neonatal opioid withdrawal syndrome and ensure that appropriate treatment will be available.** If chronic opioid exposure occurs in pregnancy, adverse events in the newborn (including withdrawal) may occur. Symptoms of neonatal abstinence syndrome (NAS) following opioid exposure may be autonomic (eg, fever, temperature instability), gastrointestinal (eg, diarrhea, vomiting, poor feeding/weight gain), or neurologic (eg, high-pitched crying, hyperactivity, increased muscle tone, increased wakefulness/abnormal sleep pattern, irritability, sneezing, seizure, tremor, yawning). Mothers who are physically dependent on opioids may give birth to infants who are also physically dependent. Opioids may cause respiratory depression and psycho-physiologic effects in the neonate; newborns of mothers receiving opioids during labor should be monitored.
- Morphine injection is commonly used for the treatment of pain during labor and immediately postpartum. Not all dosage forms are appropriate for this use. Agents other than morphine are used to treat chronic non-cancer pain in pregnant women or those who may become pregnant.

- Nonopioid analgesics are preferred for breastfeeding females who require pain control peripartum or for surgery outside of the postpartum period. However, when a narcotic is needed to treat maternal pain, morphine is one of the preferred agents. Analgesics delivered by PCA or administered by the epidural route help limit infant exposure. **Note:** Not all formulations are indicated for intermittent pain control.
- When opioids are needed in breastfeeding women, the lowest effective dose for the shortest duration of time should be used to limit adverse events in the mother and breastfeeding infant. In general, a single occasional dose of an opioid analgesic may be compatible with breastfeeding. Breastfeeding women using opioids for postpartum pain or for the treatment of chronic maternal pain should monitor their infants for drowsiness, sedation, feeding difficulties, or limpness. Withdrawal symptoms may occur when maternal use is discontinued, or breastfeeding is stopped.

REQUIREMENTS

Direct IV for neonates (e.g. neonatal intubation)

- Healthcare professional certified in neonatal intubation must be physically present

MONITORING REQUIRED

Baseline

- RR, HR, BP, sedation scale before dose

Pediatric/neonate doses given Direct IV + Adult doses greater than 5 mg given direct IV:

- RR, HR, BP, sedation scale at 5 and 15 minutes post dose

Direct IV in pediatrics: In addition to above;

- Observe patient continually for 5 minutes post dose for signs/symptoms of respiratory depression

Direct IV in neonates: In addition to above;

- Observe patient continually for 5 minutes post dose for signs/symptoms of respiratory depression
- Continuous electronic respiratory monitoring during and for 15 minutes post dose

Adult doses Direct IV:

- RR, HR, BP, sedation scale at 5 and 15 minutes post dose, urine output

RECOMMENDED

Neonatal intubation:

- Monitor urine output post dose

All patients:

- Monitor fluid intake and urine output; check for bladder distension
- Check for abdominal distension, gas or constipation

Adverse Effects

CENTRAL NERVOUS SYSTEM

- Sedation
- Dizziness
- Visual disturbances
- Mental clouding or depression
- Coma
- Euphoria/dysphoria
- Weakness
- Faintness
- Agitation/restlessness
- Nervousness
- Seizures
- Delirium
- Insomnia

RESPIRATORY

- Respiratory depression
- Apnea

CARDIOVASCULAR

- Hypotension
- Orthostatic hypotension in ambulatory patients
- Increased ventricular response rate through a vagolytic action

GASTROINTESTINAL

- Nausea, vomiting
- Constipation
- Diminished propulsive peristaltic waves in GI tract

MISCELLANEOUS

- Neonatal withdrawal syndrome: may be life-threatening. Signs and symptoms include irritability, hyperactivity, abnormal sleep pattern, high-pitched cry, tremor, vomiting, diarrhea, and failure to gain weight. Onset, duration, and severity depend on the drug used, duration of use, maternal dose, and rate of drug elimination by the newborn

Dosing

Note: Morphine may be needed in higher doses for patients who take opioids for chronic pain to maintain desired effect.

*Optimal analgesic dose varies widely among patients; while doses should be titrated to pain management consideration of sedation level and respiratory status will also guide dosing

ADULT/PEDIATRICS

- 0.05 - 0.1mg/kg **IV/IM/IN** repeat 0.025 – 0.05mg/kg **IV/IM/IN** q 15min PRN

ELDERLY

- 0.025 – 0.05mg/kg **IV/IM/IN**, repeat 0.01mg/kg **IV/IM/IN** q 15min PRN

Palliative Patient

Breathlessness (adult)

- *2.5-5mg **SQ** q4hrs around the clock and breakthrough of 1.5-3mg **SQ/PO** q30mins PRN*
- *In palliative patient who is already on narcotics for chronic pain starts experiencing breathlessness, give a breakthrough dose of morphine to treat the breathlessness.*

Pain management (adult)

- *In palliative patient who is already on narcotics and is in pain between their regular narcotic doses, consider increasing pain management dose by 10-25% or give breakthrough doses for pain.*

RENAL IMPAIRMENT ADJUSTMENTS

- Start cautiously with lower doses; titrating slowly while carefully monitoring for side effects
- Choice of an alternate opioid may be prudent in patients with baseline renal impairment or rapidly changing renal function especially since other analgesics may be safer and reduced initial morphine dosing may result in suboptimal analgesia

HEPATIC IMPAIRMENT ADJUSTMENTS

- Pharmacokinetics unchanged in mild liver disease; substantial extrahepatic metabolism may occur
- Cirrhosis increases in half-life; suggest dosage adjustment required

HEMO/PERITONEAL DIALYSIS

- Avoid use due to potential for accumulation of neurotoxic metabolites

Concentration Supplied:

- 10mg/1 ml (1ml amp)

Provider/Route:

- May be given IM or subcutaneously
- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IV, IO, CVAD, IVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/morphine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/1799128?cesid=2HyyXZmXHMs&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dmorphine%26t%3Dname%26acs%3Dtrue%26acq%3Dmorp
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=a3a93e99-2103-413f-98ff-7e05fa859d9f%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535598&db=nup
- *Palliative Program (2021)*

Development – May, 2023
Update – July 31, 2023

EMS Drug Reference Card (DRC)

Naloxone/Narcan

Classification

- Opioid antagonist

Indications

EMS INDICATIONS

- Complete or partial reversal of narcotic depression, including respiratory depression, induced by opioids
- Diagnosis of suspected acute opioid overdose

SHA EMS Medical Direction Note:

- Oxygenation and ventilation are important prior to admin to reduce hypoxic effects and combativeness of patients**. When possible recommended route is IM**.

HEALTH CANADA APPROVED

- *Complete or partial reversal of narcotic depression, including respiratory depression, induced by opioids*
- *Diagnosis of suspected acute opioid overdose*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN THE LITERATURE

- *Opioid-induced pruritus*

Mechanism of Action

- Reveres the effects of narcotics by competing for opiate receptor sites

Pharmacokinetics

- **Onset:** 1-2 minutes IV, 2-5 minutes IM/SQ, 8-13minutes IN
- **Peak:** Unknown IV/IM/SQ/IN
- **Duration:** dependent on the dose administered, and more prolonged post IM than IV; 45minutes IV, greater than 45minutes IM/SQ, unknown IN
- **Metabolism:** Primarily hepatic via glucuronidation
- **Excretion:** Urine (as metabolites)

Contraindications

- Hypersensitivity to naloxone or any other component of the formulation

Cautions

- **HIGH ALERT**
- Cardiovascular disease
- Patients, including newborns of mothers, physically dependant on opioids, as naloxone may precipitate severe withdrawal symptoms, including seizures

PREGNANCY/BREAST FEEDING

- Consult pharmacy or specialised on-line references for most recent information
- Although naloxone may precipitate opioid withdrawal in the fetus in addition to the mother, treatment should not be withheld when needed in cases of maternal opioid overdose. When using the injection, starting at the low end of the dosing range is suggested to help avoid adverse fetal events but still provide treatment to the mother. Use of naloxone to test for opioid dependence during pregnancy is not recommended.
- According to the manufacturer, the decision to continue or discontinue breastfeeding during therapy should consider the risk of infant exposure, the benefits of breastfeeding to the infant, and the benefits of treatment to the mother.

MONITORING REQUIRED

- Baseline vital signs (HR, RR, BP, O2 saturation, and level of consciousness)
- Then every 5 minutes x 3, then every 15 minutes x 3, or until stable
- Observations will depend on the opiate being treated (i.e. varying lengths of action)

RECOMMENDED

- Reversal of CNS and/or respiratory depression: Monitor patient frequently until effects of opioid wear off. Continued observation after improvement of respiratory rate for 4 to 6 hours has been recommended Opioid toxicity may be delayed in onset and protracted as compared with expected therapeutic actions especially in presence of long acting opioids (e.g. methadone – half-life 8 to 59 hours) or sustained release product. Apparent duration of action of naloxone is 45 to 70 minutes
- Assess level of pain following administration
- Assess for signs and symptoms of too rapid reversal of opioid effect (e.g. nausea, vomiting, sweating, tachycardia), especially when used postoperatively

Adverse Effects

GASTROINTESTINAL

- Nausea, vomiting

CARDIOVASCULAR

- Tachycardia, hypertension, cardiac arrest – associated with abrupt reversal of opioid depression
- Hypo/hypertension, ventricular tachycardia and fibrillation – associated with postoperative use in patients with preexisting cardiovascular disease

MISCELLANEOUS

- Sweating, tremulousness
- Excitement and significant reversal of analgesia – associated with high doses in postoperative patients
- Irritability and increased crying in the newborn
- Seizures in neonates of opioid-dependent mothers, respond to morphine

Dosing

NOTE: requirement for repeat doses is dependent on amount, type, and route of opioid administration

ADULT/ELDERLY

- 0.5 to 1.0mg **IM/IV/IN** q 2-3 minutes titrated until ventilations are adequate

PEDIATRIC/NEONATE

- 0.1 mg/kg/dose **IM/IV/IN**, up to 1 mg/dose **IM/IV/IN** q 2-3 minutes titrated until ventilations are adequate

EMR

- **IN via Nasal Atomizer:** 2mg or 4mg (whichever you stock) **IN** repeated after 2-3mins if no response
- If patient wakes up after initial dose then goes unconscious again then repeat the dose into the other nostril

Concentration Supplied:

- 2 mg/2 mL
- EMR:
  - 2mg/0.1ml per Nasal Atomizer
  - 4mg/0.1ml per Nasal Atomizer

Provider/Route:

- Can be administered IM and subcutaneously but onset of action may be delayed especially if patient has poor perfusion
- Intranasal or inhalation via nebulisation are effective alternatives when needleless administration is desired
- Can be administered via interosseous and endotracheal route
- **Recommended route is IM**
- **EMR:** Nasal Atomizer
- **PCP/ICP:** IM, IV, IN, SQ
- **ACP/CCP:** IM, IV, IN, SQ, IO, ET

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/naloxone.pdf
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7338?cesid=5CZLWYbyo9U&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dnaloxone%26t%3Dname%26acs%3Dtrue%26acq%3Dnalox
- https://web.p.ebscohost.com/nup/detail/detail?vid=5&sid=a3a93e99-2103-413f-98ff-7e05fa859d9f%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535772&db=nup

Development – May 2023
Update – July 31, 2023

Naproxen/Naprosyn/Aleve

Classification

- Non-steroidal, anti-inflammatory drug with analgesic and antipyretic properties

Indications

EMS INDICATIONS

- Muscle-skeletal trauma
- Burns
- Amputation trauma
- Pain management

HEALTH CANADA APPROVED

- *Muscle-skeletal trauma*
- *Burns*
- *Amputation trauma*
- *Pain management*
- *Anti-inflammatory*
- *Dysmenorrhea, primary*
- *Fever (alternate agent)*
- *Gout, prophylaxis during initiation of urate-lowering therapy (alternate agent)*
- *Gout, treatment*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN LITURATURE

- *Abnormal uterine bleeding, nonacute*
- *Migraine, acute treatment*

Mechanism of Action

- Inhibition of the enzyme complex prostaglandin synthetase with consequent reduction in the synthesis of prostaglandins from arachidonic acid
- The mechanism of action of naproxen, like that of other NSAIDs, is not completely understood but involves inhibition of cyclooxygenase (COX-1 and COX-2)

Pharmacokinetics

- **Onset:** 30-60minutes PO
- **Peak:** 2-4hours PO
- **Duration:** less than 12hours PO
- **Half-life:** 12 to 17 hours PO
- **Metabolized:** in the liver
- **Excreted:** Urine (95%; primarily as metabolites); feces (≤3%)

Contraindications

ABSOLUTE

- Hypersensitivity to naproxen, ASA, and NSAIDs
- Pregnancy (all trimesters)
- *Canadian labeling:* Additional contraindications: Active gastric, duodenal, or peptic ulcers; active GI bleeding; cerebrovascular bleeding or other bleeding disorders; active GI inflammatory disease; severe liver impairment or active liver disease; severe renal impairment (CrCl <30 mL/minute) or deteriorating renal disease; severe uncontrolled heart failure; known hyperkalemia; breast-feeding
- Asthma: Contraindicated in patients with aspirin-sensitive asthma; severe and potentially fatal bronchospasm may occur. Use caution in patients with other forms of asthma.
- Bariatric surgery: Gastric ulceration: Avoid chronic use of oral nonselective NSAIDs after bariatric surgery; development of anastomotic ulcerations/perforations may occur. Short-term use of celecoxib or IV ketorolac are recommended as part of a multimodal pain management strategy for postoperative pain.

RELATIVE

- During CABG surgery
- Renal failure

Cautions

- Ulcers
- GI bleed
- Risk of thrombotic events (CVA, TIA, MI)
- Use with caution in patients with hepatic impairment.
- Aseptic meningitis: May increase the risk of aseptic meningitis, especially in patients with systemic lupus erythematosus (SLE) and mixed connective tissue disorders.
- Surgical/dental procedures: Withhold for at least 4 to 6 half-lives prior to surgical or dental procedures.

PREGNANCY/BREASTFEEDING

- Contraindication in pregnancy all trimesters

Adverse Effects

GASTROINTESTINAL

- Indigestion, heartburn, stomach pains, nausea

CENTRAL NERVOUS SYSTEM

- May cause drowsiness, dizziness, blurred vision, and other neurologic effects that may impair physical or mental abilities; patients must be cautioned about performing tasks that require mental alertness (eg, operating machinery or driving). Discontinue use with blurred or diminished vision and perform ophthalmologic exam. Periodically evaluate vision in all patients receiving long-term therapy.
- Headache
- Ringing ears

HYPERKALEMIA

- NSAID use may increase the risk of hyperkalemia, particularly in patients greater than or equal to 65 years of age, in patients with diabetes or renal disease, and with concomitant use of other agents capable of inducing hyperkalemia (eg, ACE-inhibitors). Monitor potassium closely.

MISCELLANEOUS

- Bruising, itching, rash

Dosing

Administer with food, milk, or antacids to decrease GI adverse effects.

ADULT/ELDERLY

- 250 – 500mg **PO**

PEDIATRICS

- 250mg **PO**. Only to be administered in peds greater than 50 kg

Concentration Supplied: 250 mg tablets

Provider/Route:

- **EMR:** PO
- **PCP/ICP:** PO
- **ACP/CCP:** PO

Resources:

- SHA EMS Medical Director & Advisors
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7344?cesid=8RwxhOO61NZ&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dnaproxen%26t%3Dname%26acs%3Dtrue%26acq%3Dnapr
- SaskKids Pediatric Parental Manual

Development – May 2023
Update – July 31, 2023

NitroGLYCERIN/Glyceryl Titrate HIGH ALERT/ELDER ALERT

Classification

- Vasodilating agent

Indications

EMS INDICATIONS

- Congestive heart failure associated with acute myocardial infarction
- Severe unstable angina that cannot be controlled by other measures
- Acute pulmonary edema
- Chest pain of cardiac origin

HEALTH CANADA APPROVED

- *Control of blood pressure in preoperative hypertension and in the immediate post-surgical period*
- *Congestive heart failure associated with acute myocardial infarction*
- *Severe unstable angina that cannot be controlled by other measures*
- *To produce controlled hypotension during surgical procedures*

NON HEALTH CANADA APPROVED INDICATION BUT SUBSTANTIATED IN THE LITERATURE

- *Acute pulmonary edema*
- *To induce transient and rapid uterine relaxation*

Mechanism of Action

- Vascular smooth muscle relaxant resulting in general vasodilation
- Decreases cardiac workload/oxygen demand by dilating vessels which reduces the pressure against the pumping of blood (afterload) and the amount of blood that returns (preload)
- Dilates coronary and systemic arteries
- Promotes collateral circulation to ischemic regions where normal blood flow is interrupted

Pharmacokinetics

- **Onset:** 1 to 3 minutes (tab), 2 to 4 minutes (spray)
- **Peak:** 4-15minutes (spray)
- **Duration:** 25minutes (spray)
- **Metabolism:** Extensive first-pass effect; metabolized hepatically to glycerol di- and mononitrate metabolites via liver reductase enzyme; subsequent metabolism to glycerol and organic nitrate; nonhepatic metabolism via red blood cells and vascular walls also occurs
- **Excretion:** Urine (as inactive metabolites)

Contraindications

- Hypersensitivity to nitroglycerin, any component of formulation or a known idiosyncratic reaction to organic nitrates
- Hypotension or uncorrected hypovolemia (e.g. hemorrhage)
- Increased intracranial pressure (e.g. head trauma or cerebral hemorrhage)
- Constrictive pericarditis and pericardial tamponade
- Use of phosphodiesterase-5 inhibitors; sildenafil (viagra) or vardenafil within previous 24 hours: tadalafil within 48 hours
- When used for management of ST-elevation or non-ST-elevation myocardial infarctions avoid nitroglycerin in the following conditions: Hypotension (SBP less than 90 mm Hg or greater than or equal to 30 mm Hg below baseline), marked bradycardia (heart rate less than 50bpm) or tachycardia, and right ventricular infarction
- *Canadian labeling:* Additional contraindications for translingual product: Closed angle glaucoma; heart failure (aortic or mitral stenosis, constrictive pericarditis, or hypertrophic cardiomyopathy with left ventricular outflow tract obstruction).

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly: Hypotension is enhanced due to decreased baroreceptor response, decreased venous tone, and often hypovolemia (dehydration) or other hypotensive drug
- Low or normal pulmonary capillary wedge pressure predisposes to the hypotensive effects
- Patients with depleted blood volume may be subject to hypotensive crisis
- Some products contain substantial amounts of propylene glycol +/or ethanol, which may produce toxicity at high doses

DRUG INTERACTIONS

- Heparin - anticoagulant effect may be decreased, monitor PTT

PREGNANCY/BREAST FEEDING

- Consult pharmacy or specialised on-line references for most recent information

RECOMMENDED

- Continuous BP or non-invasive BP monitoring

Adverse Effects

CARDIOVASCULAR

- Hypotension, may be sudden and severe, responds to elevation of the legs, reducing or stopping infusion
- Flushing
- Reflex tachycardia
- Paradoxical bradycardia
- Paradoxical increase of anginal pain

CENTRAL NERVOUS SYSTEM

- Headache
- Dizziness
- Restlessness
- Intracranial hypertension leading to vomiting, blurred vision and bradycardia(rare, associated with high doses)
- Wernicke's encephalopathy (rare, associated with high doses)

GASTROINTESTINAL

- Nausea/vomiting
- Abdominal pain

MISCELLANEOUS

- Immediate hypersensitivity reactions (e.g. itching, tracheobronchitis, wheezing)
- Methemoglobinemia (rare; increased risk with high dose or prolonged therapy)

- Tolerance to anti-anginal and hemodynamic effects, associated with high doses and continuous infusions, may occur within 24 hours

Dosing

ADULT/ELDERLY

- 0.4 mg **SL** q 3-5min (max 3 sprays)
- PCP's must contact medical control if giving nitro in pulmonary edema of cardiac origin

EMR

- Can assist if patient has their own prescription.
- Must contact Medical Control for approval if patient does not have their own prescription
- If patient requires more than 3 sprays contact Medical Control for further dosing.

Concentration Supplied: 0.4 mg/dose SL spray

Provider/Route:

- **EMR:** Assist with patient's own prescription or contact Medical Control (See above instruction under dosing)
- **PCP/ICP:** SL
- **ACP/CCP:** SL, Monitor IV infusion

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/nitroGLYCERIN.pdf
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7377?cesid=3BbOmGDqTZC&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dnitroglycerin%26t%3Dname%26acs%3Dtrue%26acq%3Dnitro

Development – May 2023
Update - July 31, 2023

Norepinephrine/Levophed HIGH ALERT/ELDER ALERT

Classification

- Sympathomimetic

Indications

EMS INDICATIONS

- Temporary restoration and maintenance of blood pressure in acute hypotension or shock states, such as surgery, trauma, sepsis

SHA EMS Medical Direction Note:

- When a push dose presser is needed EPINEPHrine is the drug of choice

HEALTH CANADA APPROVED

- *Temporary restoration and maintenance of blood pressure in acute hypotension or shock states, such as surgery, trauma, sepsis*
- *As a temporary adjunct in the treatment of cardiac arrest and profound hypotension*

Mechanism of Action

- Norepinephrine is a vasoconstrictor that predominantly stimulates α_1 receptors to cause peripheral vasoconstriction and increase blood pressure. It also has some β_1 receptor agonist activity that results in a positive inotropic effect on the heart at higher doses.

Pharmacokinetics

- **Onset:** Immediate
- **Peak:** Rapid
- **Duration:** 1-2minutes
- **Metabolized** through the liver and other tissues by a combination of reactions; Via catechol-o-methyltransferase and monoamine oxidase.
- **Metabolism and Excretion:** Taken up and metabolized rapidly by sympathetic nerve endings.
- **Excretion:** Urine (as inactive metabolites; small amounts as unchanged drug).

Contraindications

- Hypersensitivity to bisulfites or any other component of the formulation
- Suspected mesenteric infarction or thrombosis, due to risk of increasing ischemia and extending area of infarction

Cautions

- **HIGH ALERT, ELDER ALERT**
- Elderly; due to potential for decreased organ function and concomitant disease or drug therapy
- Correct hypovolemia prior to starting norepinephrine. In emergencies, may be given before and concurrently with volume replacement
- Hypercapnia or hypoxia: cardiac arrhythmias may occur
- Occlusive vascular disease avoid - using leg veins for administration

DRUG INTERACTIONS

- MAO inhibitors, tricyclic antidepressants, serotonin/norepinephrine reuptake inhibitors (e.g. venlafaxine): may potentiate pressor response
- Linezolid: May enhance hypertensive effect. Monitor for enhanced pressor response and adjust dose accordingly

PREGNANCY/BREASTFEEDING

- Medications used for the treatment of cardiac arrest in pregnancy are the same as in the non-pregnant woman. Appropriate medications should not be withheld due to concerns of fetal teratogenicity. Norepinephrine use during the post-resuscitation phase may be considered; however, the effects of vasoactive medications on the fetus should also be considered. Doses and indications should follow current Advanced Cardiovascular Life Support guidelines.
- The manufacturer recommends that caution be exercised when administering norepinephrine to breastfeeding women.

REQUIREMENTS

- Electronic infusion device Central venous access device required. Peripheral line may be used only as an interim measure until a central line can be inserted

PEDIATRIC

- Consultation with Critical Care or Transport team

MONITORING REQUIRED

- Continuous ECG monitoring
- Continuous BP monitoring or every 3 to 5 minutes by cuff until continuous monitoring available
- If given peripherally, assess IV site for signs of extravasation (area will appear cold, hard and pale) every 30 minutes until a central line can be inserted

MONITORING RECOMMENDED

- Advise patients to report burning/stinging/pain at IV site promptly
- Ensure adequate intravascular volume
- Assess extremities for changes in colour or temperature

Adverse Effects

CARDIOVASCULAR

- Severe peripheral and visceral vasoconstriction, associated with hypovolemia, decreased renal perfusion and decreased urine output, tissue hypoxia, and metabolic acidosis
- Plasma volume depletion, associated with prolonged use
- Decreased cardiac output due to increased peripheral vascular resistance, associated with prolonged use or large doses
- Hypertension (responds to IV phentolamine), reflex bradycardia
- Potentially fatal cardiac arrhythmias, including ventricular tachycardia and ventricular fibrillation

CENTRAL NERVOUS SYSTEM

- Anxiety
- Headache (may be a symptom of hypertension)

RESPIRATORY

- Dyspnea

EXTRAVASATION

- Results in sloughing and necrosis
- Blanching along vein pathway is preliminary sign of extravasation

TREATMENT

- Stop infusion
- Restart norepinephrine at new IV site and notify physician immediately

Dosing

Do not stop infusion abruptly; rate should be gradually tapered

Must be administered via IV pump – 4mg/4ml x 4 vials or 16mg/250mls D5W = 64mcg/ml

If MAP remains below 65mmHg or systolic blood pressure below 90mmHg despite norepinephrine infusion greater then or equal to 1mcg/kg/min consult expert opinion

ADULT - INITIAL DOSE

- 0.1mcg/kg/minute **IV Infusion via pump** increased by 0.05mcg/kg/min to maintain a perfusing blood pressure.
    - Maximum dose: 1mcg/kg/minute

ELDERLY

- Initial dosage usually should be at low end of adult dosing range

PEDIATRIC

- 0.1 mcg/kg/minute **IV Infusion via pump** titrated to maintain a perfusing blood pressure
    - Maximum dose: 1mcg/kg/minute

Concentration Supplied: 4mg/4 ml (4ml vial)

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/norepinephrine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7381?cesid=0cHnou8SLvg&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dnorepinephrine%26t%3Dname%26acs%3Dtrue%26acq%3Dnor
- https://web.s.ebscohost.com/nup/detail/detail?vid=7&sid=e67d9564-4b9e-4b76-9f75-e6018ac9f9c2%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565387&db=nup

Development – May 8, 2023
Update – July 31, 2023

Ondansetron/Zofran

Classification

- Antiemetic

Indications

EMS INDICATIONS

- Prevention of nausea and vomiting

HEALTH CANADA APPROVED

- *Prevention of nausea and vomiting associated with emetogenic chemotherapy and radiotherapy*
- *Prevention and treatment of post-operative nausea and vomiting in patients 65 years of age and younger*

Mechanism of Action

- A selective 5-HT3 receptor antagonist, blocking serotonin both peripherally on vagal nerve terminals and centrally in the chemoreceptor trigger zone

Pharmacokinetics

- **Onset:** Rapid IV/PO/IM
- **Peak:** 15-30mins IV/PO, 40mins IM
- **Duration:** 4-8hours IV/PO, Unknown IM
- **Metabolism:** extensively hepatic via hydroxylation
- **Excretion:** Urine (44% to 60% as metabolites, ~5% as unchanged drug); feces (~25%)

Contraindications

- Hypersensitivity to Ondansetron or any component of the formulation

Cautions

- **ELDER ALERT**
- Elderly: increased risk of QT prolongation, decreased max single dose and rate of administration recommended
- **GASTROINTESTINAL**
- Single doses greater than 16 mg IV (in those less than 75 years of age) or continuous infusions are no longer recommended due to the potential for an increased risk of QT prolongation
- Patients with congenital long QT syndrome or patients with other risk factors for QT prolongation; hypokalemia or hypomagnesemia, heart failure, bradyarrhythmias
- **Not effective in preventing motion-induced nausea and vomiting**

PREGNANCY CONSIDERATIONS

- PREGNANCY/BREAST FEEDING: Consult pharmacy or specialised on-line references for most recent information

- Ondansetron crosses the placenta.
- **Ondansetron can be detected in fetal tissue. The risk of developing a major congenital malformation following first trimester exposure is under study.**
- According to the manufacturer, the decision to breastfeed during therapy should consider the risk of infant exposure, the benefits of breastfeeding to the infant, and the benefits of treatment to the patient.

DRUG INTERACTION

- Drugs that prolong the QT interval (e.g. amiodarone, macrolides, fluroroquinolones, haloperidol, risperidone), cumulative high-dose anthracycline therapy; clinically relevant QT interval prolongation may occur resulting in Torsade de pointes
- TraMADol: may diminish analgesic effect of TraMADol. Monitor therapy
- Proserotonergic drugs (e.g. antidepressants; especially SSRI and MAO inhibitors) may enhance the serotonergic effect, resulting in serotonin syndrome. Monitor therapy

REQUIREMENTS

- Electronic infusion device

MONITORING REQUIRED

- Monitor for hypersensitivity reaction(s)

RECOMMENDED

- Baseline ECG if applicable, serum potassium and magnesium

Adverse Effects

GASTROINTESTINAL

- Constipation
- Abdominal pain
- Stomach cramps

CARDIOVASCULAR

- Dose-dependent QT interval prolongation
- Torsade de pointe has been reported
- Dose-dependent increases in ECG intervals (e.g. PR, QRS duration QT/QTc, JT), usually occurring 1 to 2 hours after IV administration
- Reduction in heart rate

CENTRAL NERVOUS SYSTEM

- Headache, usually mild but may be severe. Responds to Acetaminophen
- Malaise, fatigue
- Dizziness or light-headedness
- Drowsiness

HEPATIC

- Transient increases of AST and ALT greater than 2 time upper limit normal

MISCELLANEOUS

- Hypersensitivity reactions: rash, bronchospasm, uticaria, angioedema (rare)
- Dry mouth, fever, chills
- Serotonin syndrome, hypertension, tachycardia, tachypnea, hyperthermia (greater than 41.1◦C)

Dosing

ADULT
65 years or less

- **IV** - doses 4 mg or less: diluted or undiluted; administer over 2 to 5 minutes q 6 hours
- **IV Infusion** – dilute in 50 mL mini bag; infuse over 20 minutes
- **IM** – 4mg undiluted

ELDERLY
65 years or older

- **IV infusion** – dilute in 50 mL mini bag; infuse over 20 minutes q 6 hours

PEDIATRIC

- Less than 5 years 2mg **IV** over 2 to 5 minutes q 6 hours, **IM**
- Greater than 5 years 4mg **IV** over 2 to 5 minutes q 6 hours, **IM**

HEPATIC IMPAIRMENT ADJUSTMENTS

- Maximum 8 mg/day recommended for severe hepatic insufficiency

Concentration: 2 mg/mL in 4 mL vial

Provider/Route:

- Recommended route IV or IM if unable to establish IV as PO for vomiting is not best practice.
- **EMR:** Not in scope of practice
- **PCP/ICP:** IM, IV, PO
- **ACP/CCP:** IM, IV, PO, IO

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/ondansetron.pdf
- SaskKids Pediatric Parental Manual
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7399?cesid=0rM0soJ3K2S&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dondansetron%26t%3Dname%26acs%3Dtrue%26acq%3DONDA
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=e8cf2271-9450-4ece-ac37-29733e2c4e1c%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535591&db=nup

Development – May 2023
Update – July 31, 2023

Oxytocin/Syntocinon HIGH ALERT

Classification

- Oxytocic

Indications

EMS INDICATIONS

- Postpartum: To produce uterine contractions during the third stage of labor (after delivery of anterior shoulder) and to control postpartum bleeding or hemorrhage

HEALTH CANADA APPROVED

- *Antepartum: Induction of labor in patients with a medical indication (e.g., Rh problems, maternal diabetes, preeclampsia, at or near term); stimulation or reinforcement of labor (as in selected cases of uterine inertia); adjunctive therapy in management of incomplete or inevitable abortion*
- *Postpartum: To produce uterine contractions during the third stage of labor and to control postpartum bleeding or hemorrhage*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Contraction stress test (oxytocin challenge test) to evaluate the adequacy of fetal-placental function in high risk pregnancies*

Mechanism of Action

- Oxytocin stimulates uterine contractions by acting on receptors that trigger the release of intracellular calcium and local prostaglandin production.

Pharmacokinetics

- **Onset:** 3 – 5 minutes IM; 1 minute IV
- **Duration**: 2 to 3 hours IM; 1 hour IV
- **Half Life:** 1 to 6 minutes
- **Excretion:** Urine (small amount unchanged)

Contraindications

- Hypersensitivity to oxytocin, any component of formulation or carbetocin. Note: this is the only contraindication when used postpartum

Cautions

- **HIGH ALERT**
- Before delivery, the spontaneously labouring uterus is extremely sensitive to oxytocin; avoid high doses. Conversely during mid trimester (13 to 20 weeks) much higher doses (20 units or greater) and rates of administration are tolerated
- Hypotension, patients already hypovolemic from haemorrhage, or with cardiac disease limiting cardiac output; avoid bolus doses as resulting transient hypotension may compound problem

DRUG INTERACTIONS

- Concurrent use of dinoprostone with oxytocin is contraindicated. A dosing interval of at least 30 minutes is recommended for sequential use of oxytocin following removal of dinoprostone vaginal insert, 6 hours after application of dinoprostone gel, and 4 hours after last misoprostol dose

MONITORING REQUIRED DIRECT IV

- Monitor as ordered

ALL OTHER INDICATIONS:

CONTINUOUS INFUSION AT INITIATION AND WITH RATE INCREASES

- Baseline BP and HR; then every 5 minutes x 2

RECOMMENDED

- Continuous ECG monitoring in patients with significant cardiac disease with haemodynamic compromise
- Monitor blood pressure, fluid intake and output, fetal heart rate and labor progression if using oxytocin for induction. Record length and duration of contractions. Obtain baseline pulse, respirations, blood pressure, and fetal heart tones

Adverse Effects

CARDIOVASCULAR

- Transient hypotension (1 to 3 minutes), associated with rapid (10 seconds) injection
- Transient but significant decreases in BP, cardiac arrhythmias; associated with large amounts of oxytocin in patients already hypotensive
- Fetal sinus bradycardia, tachycardia, PVC's, permanent CNS or brain damage and death secondary to asphyxia

RENAL

- Dilutional hyponatremia (water intoxication with headache and nausea) if administered in a large volume of electrolytefree aqueous dextrose solution at rates of 40 milliunits/minute or higher

UTERINE

- Uterine tachysystole (more than 5 contractions in 10 minutes averaged over 30 minutes) occurs with greater frequency if oxytocin continuous infusion is increased every 15 to 20 minutes versus every 30 to 60 minutes
- Uterine tachysystole can lead to uterine rupture, utero-placental hypoperfusion and fetal distress from hypoxia

MISCELLANEOUS

- Nausea and vomiting. May be related to labor and not the drug
- Thrombocytopenia, afibrinogenemia and hypoprothrombinemia (rare)
- Anaphylactoid reactions; dyspnoea, hypotension, shock (rare)

Dosing

Post Birth:

- 10 units **IM** at the time of delivery of anterior shoulder

Post Partum Hemorrhage:

- 5-10 units in 50ml NaCl **IV infusion** over 5-10 minutes via pump

Concentration Supplied:

- 10 units/ml (1ml amp)

Reconstitution

- Avoid diluting in D5W to prevent dilutional hyponatremia

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** Monitor Infusion Only
- **ACP/CCP:** IM, IV, IO,

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/oxytocin.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7426?cesid=4G7uKx7Ox0p&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Doxytocin%26t%3Dname%26acs%3Dtrue%26acq%3Doxy

Development – May, 2023
Update – July 31, 2023

Salbutamol/Albuterol/Ventolin

Classification

- Bronchodilater – Beta 2 – adrenergic stimulant

Indications

EMS INDICATIONS

- Severe bronchospasm associated with acute exacerbations of chronic bronchitis and bronchial asthma
- Bronchospasm in anaphylaxis
- Treatment of status asthmaticus
- Hyperkalemia (if hx of dialysis in cardiac arrest or sine wave present)

HEALTH CANADA APPROVED

- *Severe bronchospasm associated with acute exacerbations of chronic bronchitis and bronchial asthma*
- *Treatment of status asthmaticus*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Hyperkalemia (if hx of dialysis and sine wave present)*

Mechanism of Action

- Produces bronchodilation through stimulation of Beta2-adrenergic receptors in bronchial smooth muscle, which causes relaxation of bronchial smooth muscle fibers from the trachea to the terminal bronchial tree
- Redistributes and induces a transcellular shift of potassium

Pharmacokinetics

- **Onset:** less than 5mins NEB, 5-8mins MDI
- **Peak:** 30mins NEB, 25mins MDI
- **Duration:** 3 to 6hours NEB, 4 to 6hours MDI; 15 to 90 minutes (hyperkalemia)
- **Metabolism:** Hepatic to an inactive sulfate
- **Excretion:** Urine and Feces

Contraindications

- Hypersensitivity to salbutamol or any component of the formulation
- Tachyarrhythmias
- Risk of abortion during first or second trimester

Cautions

- Idiopathic hypertrophic sub-valvular stenosis

- Cardiovascular disorders especially coronary insufficiency, cardiac arrhythmias and hypertension; may cause elevation in blood pressure, heart rate and result in CNS stimulation/excitation. May also increase risk of arrhythmias
- Diabetes mellitus, hyperthyroidism, or convulsive disorders
- Patients unusually responsive to sympathomimetic amines
- Glaucoma: Use with caution in patients with glaucoma; may elevate intraocular pressure.
- Hypokalemia: Use with caution in patients with hypokalemia; beta-2 agonists may decrease serum potassium.
- Renal impairment: Use with caution in patients with renal impairment.

DRUG INTERACTONS

- MAO inhibitors or tricyclic antidepressants: effect on the vascular system may be potentiated

PREGNANCY/BREAST FEEDING

- Contact pharmacy for most recent information

Adverse Effects

CARDIOVASCULAR

- Palpitations, tachycardia
- Arrhythmias (atrial fibrillation, supraventricular tachycardia and extrasystoles)
- Angina peripheral vasodilation, hypo/hypertension

CENTRAL NERVOUS SYSTEM

- Nervousness, muscle tremor, headache (common). A reduction in dosage might lessen symptoms
- Agitation

HYPERSENSITIVITY

- Urticaria, edema, rash, bronchospasm, anaphylaxis

METABOLIC

- Hyperglycemia, usually slight transient
- Hypokalemia

Dosing

ADULT/ELDERLY

MDI with AERO Chamber**:**

- 10 puffs@100mcg (interspersed with Atrovent for first 5 puffs) may repeat Ventolin up to 3 rounds; **see below

Nebulized:

- 2.5mg – 5.0 mg, may repeat PRN
    - Hyperkalemia 10-20 mg over 10 minutes

PEDIATRIC

MDI with AERO Chamber**:**

- **Greater than 20kg**: 10 puffs @100mcg (interspersed with Atrovent for first 5 puffs) may repeat Ventolin up to 3 rounds; **see below
- **Less than 20kg**: 5 puffs @100 mcg (interspersed with Atrovent for the first 4 puffs) may repeat Ventolin up to 3 rounds; **see below
- **Less than 10kg**: MDI not indicated; NEB Still indicated

Nebulized:

- 1.25mg – 2.5mg, may repeat PRN

Concentration Supplied:

- 2.5 mg/2.5 mL; MDI 100 mcg per puff

Provider/Route:

- **EMR:** Not in scope of practice
- **PCP/ICP:** nebulized with 6-8 litres of O2, MDI with spacer
- **ACP/CCP:** nebulized with 6-8 litres O2, MDI with spacer, ETT

Resources:

- SHA EMS Medical Director & Advisors
- SCOP Patient Care Plans (2020)
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/salbutamol.pdf
- PALS 2020
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/6292?cesid=2I80Sdw85XZ&hitReason=international-brand name&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dsalbutamol%26t%3Dname%26acs%3Dtrue%26acq%3Dsalb
- ACLS for Experienced Providers 2017
- AB and BC EMS protocols (for peds MDI)

*****Dosing of Atrovent and Ventolin should look like this:***

- **1 ventolin puff at a time, waiting 30-60 seconds between up to 10 puffs.**
  Follow each ventolin with a puff of atrovent 10 seconds post for 5 puffs.
  If the patient in extremis this wait time can be shortened as practitioner feels is appropriate
  Wait 5 - 10 minutes between sets of 10 puffs to observe for effect.
  Repeat sets of 10 puffs up to 3 times (30 puffs)
  Atrovent is only given during the first round of 10 puffs for 5 puffs. Repeat sets are ventolin only.

Development – May 2023
Update – July 31, 2023

Sodium Bicarbonate Elder Alert

Classification

- Alkalinising agent

Indications

EMS INDICATIONS

- Prolonged cardiac arrest
- Known TCA overdose or existing hyperkalemia with QRS widening (greater than 0.10 sec.) or hypotension
- Hyperkalemic cardiac arrest

SHA EMS Medical Direction Note:

- Sodium Bicarbonate should be administered post placement of ETT/SGA

HEALTH CANADA APPROVED

- *Metabolic acidosis associated with many conditions including severe renal disease (e.g. renal tubular acidosis), uncontrolled diabetes (ketoacidosis – low dose insulin preferred), extracorporeal circulation of the blood, cardiac arrest, and lactic acidosis. Routine use in cardiac arrest is not recommended*
- *When urinary alkalisation is required in the treatment of certain drug intoxications, and in hemolytic reactions*
- *In severe diarrhea when loss of bicarbonate has been significant: as an adjunct in the treatment of hyperkalemia*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN LITURATURE

- *Drug overdose with agents that produce cardiotoxic effects involving sodium channel blockade*
- *Urine alkalinization to reduce frequency of contrast medium-induced nephrotoxicity*

Mechanism of Action

- Dissociates to provide bicarbonate ion which neutralizes hydrogen ion concentration and raises blood and urinary pH

Pharmacokinetics

- **Onset:** Rapid
- **Peak:** Rapid
- **Duration:** 8-10 minutes
- **Excretion:** Urine (less than 1%)

Contraindications

- Metabolic or respiratory alkalosis
- Hypocalcemia (because of an increased risk of alkalosis-induced tetany)
- Excessive chloride loss from vomiting or continuous gastrointestinal suction

Cautions

- ELDER ALERT
- Elderly – Contains sodium; caution in those with renal or cardiovascular insufficiency with or without heart failure
- Full correction of acidosis should not be attempted in the first 24 hours of therapy
- Cardiac, liver or renal disease; heart failure, fluid/solute overload and postoperative patients with renal or cardiovascular insufficiency, and those receiving corticosteroids
- Use in cardiac arrest indicated only if prolonged resuscitation with effective ventilation or after return of spontaneous circulation after a longer arrest interval. Adequate alveolar ventilation should control acid-base balance in most arrest situations except prolonged cardiac arrest, arrested patient with pre-existing metabolic acidosis, hyperkalemia, or tricyclic or barbiturate overdose

PREGNANCY/BREASTFEEDING

- Contact pharmacy or specialised on-line references for most recent information

REQUIREMENTS

- Flush line before and after administration

RECOMMENDED

- Blood gases and serum electrolyte concentrations, several times daily during intensive treatment and daily in most other situations
- Urine pH, if goal is to alkalinise urine

Adverse Effects

HEMATOLOGIC

- Excessive alkalosis
- Hypocalcemic tetany
- Paradoxical intracellular acidosis
- Hypokalemia
- Hypernatremia (edema, heart failure)
- Hyperosmolality

EXTRAVASATION

- 8.4% sodium bicarbonate is hypertonic: May cause tissue inflammation and necrosis at IV site and surrounding infiltrated area

TREATMENT

- Discontinue drug immediately and notify physician. Apply cold intermittent compresses

Dosing

ADULT

- Prolonged OR Hyperkalemic cardiac arrest – 1mEq/kg **IVP**
- Known TCA overdose or hyperkalemia – 1mEq/kg **IVP** (QRS > 0.10 seconds or hypotensive)

RENAL IMPAIRMENT ADJUSTMENTS

- Excessive sodium loading should be avoided in patients with severe renal impairment

HEPATIC IMPAIRMENT ADJUSTMENTS

- Excessive sodium loading should be avoided in patients with severe hepatic impairment

MISCELLANEOUS

- 1 mmol (1 mEq) of sodium bicarbonate = 1 mmol (1 mEq) each of sodium and bicarbonate ions
- 50 mL 8.4% sodium bicarbonate = 50 mmol (50 mEq) sodium bicarbonate
- Extravasation - 8.4% sodium bicarbonate is hypertonic – See ADVERSE REACTIONS

Concentration Supplied:

- 1mEq/ml (50ml preload)

COMPATIBILITY/STABILITY

- Stability in D5W and NS for at least 24 hours at room temperature and in the refrigerator is assumed
- Compatible with sterile water, dextrose, saline and dextrose-saline combination solutions
- **Incompatible with calcium and solutions containing calcium (e.g. Ringer's and lactated Ringer's solutions)**
- For additional drug-drug compatibility, contact pharmacy

Provider/Route:

- May be given by subcutaneous injection if diluted to isotonicity (1.5% solution - 0.178 mmol/L)
- IM: not recommended
- May be given via IO cannulation but acid-base analysis is inaccurate
- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IV, IO,

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/sodium%20bicarbonate.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7677?cesid=99lNVrHOnnH&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dsodium%2Bbicarbonate%26t%3Dname%26acs%3Dtrue%26acq%3Dsod
- https://web.p.ebscohost.com/nup/detail/detail?vid=5&sid=7784f8a3-b581-475b-ac59-6a53fd087633%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535664&db=nup

Development – May, 2023
Update – July 31, 2023

Thiamine/Vitamin B1

Classification

- Vitamin

Indications

EMS INDICATIONS

- Hypoglycemic patients who have received D50W and appear malnourished
- Prophylaxis and treatment of thiamine deficiency, including Wernicke's encephalopathy and beriberi.

HEALTH CANADA APPROVED

- *Prophylaxis and treatment of thiamine deficiency, including Wernicke's encephalopathy and beriberi.*

Mechanism of Action

- Coenzyme for various metabolic functions, including fat and carbohydrate metabolism and protein synthesis, used in cell replication and hematopoiesis

Pharmacokinetics

- **Onset:** Hr
- **Peak:** Days
- **Duration:** Days to wk
- **Metabolism:** In the liver
- **Excretion:** Urine (as unchanged drug and as pyrimidine after body storage sites become saturated)

Contraindications

- Hypersensitivity to thiamine and any other component of formulation

Cautions

- If possible thiamine administration should precede glucose administration when treating patients for Wernicke's encephalopathy, however glucose administration should not be withheld while awaiting thiamine
- Vitamin deficiency: Single vitamin deficiency is rare; evaluate for other deficiencies
- Patients with suspected hypersensitivity, some manufacturers recommend intradermal test doses, however further details on dosing or recommended monitoring are not given

PREGNANCY/BREAST FEEDING

- Consult pharmacy or specialised on-line references for most recent information

Adverse Effects

CENTRAL NERVOUS SYSTEM

- Feeling of warmth
- Sweating
- Weakness

GASTROINTESTINAL

- Nausea

HYPERSENSITIVITY

- Hypersensitivity reactions, e.g. itching, sneezing, wheezing, or anaphylactic shock. Studies have shown that hypersensitivity reactions can occur with equal frequency by any route. Incidence after IV administration is less than 0.1%. May increase in frequency with repeat injections

Dosing

- 100mg **SIVP**

Concentration Supplied:

- 100mg/ml (1ml amp)

COMPATIBILITY/STABILITY

- Incompatible with alkaline or neutral solutions (i.e. barbiturates or bicarbonates)
- Incompatible with oxidizing and reducing agents. In solutions with sulfites or bisulfites, it is rapidly inactivated

Provider/Route:

- Can be given IM but **recommended route is IV**
- **EMR:** Not in scope of practice
- **PCP/ICP:** Not in scope of practice
- **ACP/CCP:** IM, IV, IO,

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/thiamine.pdf
- https://online.lexi.com/lco/action/doc/retrieve/docid/patch_f/7755?cesid=0QCKK8qRQHE&searchUrl=%2Flco%2Faction%2Fsearch%3Fq%3Dthiamine%26t%3Dname%26acs%3Dtrue%26acq%3Dthia
- https://web.p.ebscohost.com/nup/detail/detail?vid=3&sid=c22b2a91-4356-42c2-8e14-4961cd2f6414%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009535406&db=nup

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Update – July 31, 2023

Tranexamic Acid

Classification

- Hemostatic agent

Indications

EMS INDICATIONS

- Trauma-associated hemorrhage
- Treatment of postpartum hemorrhage

SHA EMS Medical Direction Note:

- IV Infusion

HEALTH CANADA APPROVED

- *Hereditary angioneurotic oedema*
- *Increased local fibrinolysis when the diagnosis is indicative of hyperfibrinolysis, as with conization of the cervix, dental extraction in patients with coagulopathies (in conjunction with antihaemophilic factor) epistaxis, hyphaema, and menorrhagia (hypermenorrhea)*

NON HEALTH CANADA APPROVED INDICATIONS BUT SUBSTANTIATED IN THE LITERATURE

- *Trauma-associated hemorrhage*
- *Treatment of postpartum hemorrhage*
- *Prevention or treatment of bleeding or other symptoms in indications in which local or systemic hyperfibrinolysis or hyperfibrinogenolysis is considered to be involved: including perioperative bleeding in various types of surgery*

Mechanism of Action

- Forms a reversible complex that displaces plasminogen from fibrin resulting in inhibition of fibrinolysis; it also inhibits the proteolytic activity of plasmin

Pharmacokinetics

- **Onset:** Unknown
- **Peak:** Unknown
- **Duration:** 7-8hours
- **Half-life**: 2hours
- **Excretion:** Urine (>95% as unchanged drug).

Contraindications

- Hypersensitivity to tranexamic acid or any component of formulation
- Acquired defective color vision; used as an indicator of toxicity
- Active intravascular clotting process
- Subarachnoid haemorrhage; potential occurrence of cerebral ischemic complications
- Patients with active thromboembolic disease, such as deep vein thrombosis, pulmonary embolism, and cerebral thrombosis
- Hematuria

Cautions

- Disseminated intravascular coagulation (DIC): Use with extreme caution in patients with DIC requiring anti-fibrinolytic therapy
- Renal impairment, due to the risk of accumulation
- Massive renal hemorrhage of any cause; risk of clot retention in renal pelvis
- Uncorrected cardiovascular or cerebrovascular disease due to the complications of thrombosis
- The risk for thromboembolic events may be increased in patients using hormonal contraceptives

DRUG INTERACTION

- Anti-inhibitor coagulant complex/factor IX complex concentrates: Concurrent use is not recommended due to increased risk of thrombosis

PREGNANCY/BREAST FEEDING

- Consult pharmacy or specialized on-line references for most recent information

REQUIREMENTS

- Electronic infusion device Ensure given at appropriate rate as can cause hypotension if given quickly

MONITORING REQUIRED

- Monitor for hypersensitivity reaction(s)

RECOMMENDED

- In repeated treatment or if treatment will last more than several (2 to 3) days, a complete ophthalmologic examination (visual acuity, color vision, eye ground, visual fields) should be done before and at regular intervals during treatment
- Seizures with higher dosing

Adverse Effects

All side effects may subside with reduced dosage or rate of administration

CARDIOVASCULAR

- Hypotension, primarily when administered at a rate greater than 100 mg/minute
- Thromboembolic events (e.g. central retinal artery and vein obstruction, pulmonary embolism), have been reported rarely

CENTRAL NERVOUS SYSTEM

- Seizures; most often with intraoperative high dose use (e.g. greater than 50 mg/kg) and in older patients
- Dizziness

GASTROINTESTINAL

- Nausea/vomiting
- Diarrhea

Dosing

***IF TRAUMA OR BIRTH IS WITHIN 3 HRS**

ADULT (BP less than 90mmHg or HR greater than 110bpm)

- **IV Infusion:** 2g in 100ml NaCl infused over 20min

PREGNANCY (BP less than 100mmHg or HR greater than 120bpm)

- **IV Infusion:** 2g in 100ml NaCl infused over 20min

RENAL IMPAIRMENT ADJUSTMENTS

- Tranexamic acid blood levels are increased in patients with renal insufficiency. Dose modifications are required in patients with renal insufficiency

DENTAL EXTRACTION IN HEMOPHILIA IF A PATIENT CANNOT TOLERATE ORAL ADMINISTRATION
Creatinine Clearance (GFR) mL/minute - dose

- 20 to 50 - 10mg/kg every 12 hours
- 10 to 20 - 10mg/kg every 24 hours
- Less than 10 - 5mg/kg every 24 hours

Concentration Supplied:

- 100mg/ml (10mL vial)

Provider/Route:

- IV infusion via pump
- **EMR:** Not in scope of practice
- **PCP/ICP:** Monitor Infusion Only
- **ACP/CCP:** IV, IO, CVAD

Resources:

- SHA EMS Medical Director & Advisors
- https://collaboration.web.ehealthsask.ca/sites/smartpump/Monographs/tranexamic%20acid.pdf
- https://online.lexi.com/lco/action/search?q=tranexamic%20acid&t=name&acs=true&acq=tra
- https://web.s.ebscohost.com/nup/detail/detail?vid=3&sid=2f9fa652-b268-44bc-984b-d320f8dd5d99%40redis&bdata=JnNpdGU9bnVwLWxpdmUmc2NvcGU9c2l0ZQ%3d%3d#AN=2009565501&db=nup

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