E01: Hypoglycemia and Hyperglycemia

Sheena Osborne

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Introduction

Diabetes mellitus (DM) is a common disease affecting the endocrine system. DM can be classified into Type 1, Type 2, and gestational diabetes. These diseases produce complications that are commonly encountered in the out-of-hospital environment, including hypoglycemia, hyperglycemia, diabetic ketoacidosis (DKA), and hyperosmolar hyperglycemic state (HHS). Disruptions in blood glucose levels are the hallmark of all diabetic emergencies. A typical blood glucose (BG) level is 4.0-7.0 mmol/L and may be slightly higher after meals. A blood glucose measurement < 4.0 mmol/L is considered hypoglycemia and should be corrected.

The goals of care include early recognition of abnormal blood glucose levels, followed by the immediate correction of hypoglycemia. Paramedics and EMRs/FRs should investigate the underlying cause of hypoglycemia and treat concurrent illnesses. Patients with hyperglycemia, diabetic ketoacidosis, or HHS require immediate conveyance and supportive care, often including fluid replacement.

Essentials

- Early recognition of abnormal BG levels and identification of underlying pathologies.
- Hypoglycemic patients who are able to swallow and follow commands should be given oral glucose preferentially.
- Hypoglycemic patients who are unable to follow commands should receive intravenous dextrose or intramuscular glucagon.
- Hyperglycemic patients, and those with suspected diabetic ketoacidosis or HHS, should be conveyed urgently and evaluated for possible fluid replacement.

Additional Treatment Information

- Diabetic emergencies often involve an alteration in a patient's level of consciousness. Ensure the airway is patent and manage as required.
- Patients experiencing an episode of hypoglycemia who are able to follow directions can be encouraged to eat long-acting carbohydrates (e.g., a sandwich or fruit) when available. This provides a more sustained correction of blood glucose and may be preferred over other interventions, provided paramedics or EMRs/FRs do not suspect any other underlying problems (such as infection).
- Blood glucose levels should be retested to measure the effectiveness of treatment and to confirm adequate reversal of hypoglycemia.
- During IV administration of dextrose solutions, ensure IV is patent as extravasation causes tissue necrosis.
- Fluid therapy may be necessary during diabetic emergencies. Assess for signs of dehydration and provide IV fluid if required. Patients in hyperglycemic states often become dehydrated; diabetic ketoacidosis and HHS can cause profound hypotension.
- Paramedics and EMRs/FRs must consider other causes of altered levels of consciousness, particularly in those patients whose blood glucose levels have been corrected but remain obtunded.

Referral Information

Adult patients who experience an explained hypoglycemic episode that is fully resolved may wish to decline conveyance. Patients who elect to not be conveyed must:

- Not have a concurrent acute illness
- Not have suffered a drug overdose, nor consumed excessive alcohol
- Not be taking oral hypoglycemic medications
- Not have experienced another hypoglycemic episode requiring treatment within the past 24 hours
- Not have any abnormal vital signs, including blood pressure and decreased Glasgow Coma Scale

- Not be febrile
- Have fully recovered from their hypoglycemic episode with a return to normal mentation; post-recovery blood glucose shall be ≥ 4.0 mmol/L
- Be attended to by a responsible adult who will stay with the patient for at least 4 hours
- Have completed the appropriate waivers and demonstrated, to the paramedic or EMR's satisfaction, that they understand the recommendations for follow-up care

General Information

- Causes of hypoglycemia (< 4.0 mmol/L) include: missed meals; an overdose of insulin or oral hypoglycemic agent; recent changes in medications; higher than normal amounts of physical activity; underlying illess (particularly infections); alcohol consumption; or other physiological stressors.
- Signs and symptoms of hyperglycemia include: thirst and polydipsia; polyphagia; polyuria; blurred vision; dehydration; and nausea.
- Common causes of hyperglycemia include: infection; medication changes or mismanagement; changes in diet; increased emotional stress; or a reduction in physical activity. Hyperglycemia is sometimes the initial finding prior to a diagnosis of diabetes.
- DKA is a life-threatening emergency primarily affecting Type 1 diabetics. It may represent a first-time presentation of diabetes; 25% of patients who present with DKA have no prior diagnosis of diabetes.
  - It is typically the result of an insulin deficiency and a surge in counter-regulatory hormones and can be trigged by a variety of causes. DKA results in hyperglycemia, ketosis from fatty acid breakdown, dehydration, metabolic acidosis, and electrolyte disturbances. Patients commonly present with altered levels of consciousness, nausea and vomiting, an elevated blood glucose level, abdominal pain, and a 'fruity' or ketone odor on their breath.
  - The increase in ketone body production causes a metabolic acidosis, which in turn drives compensatory hyperventilation (Kussmaul's respirations). This ventilatory rate is intended to lower $PaCO_2$ and counteract the decrease in pH.
- HHS, formerly known as hyperosmolar hyperglycemic nonketotic coma, is similar to DKA, though it is more common in Type 2 diabetics. Patients experience an extreme elevation in blood glucose and significant dehydration, but do not experience the same acidosis and ketosis as would be seen in DKA.
- Gestational diabetes has a similar pathogensis as Type 2 diabetes and is the cause of glucose intolerance in pregnancy. It can be managed in the same way as diabetes mellitus and affects approximately 7% of pregnancies.

Interventions

First Responder

- Position patient in lateral position if unconscious
- Evaluate for stroke signs and symptoms
- Assess and maintain airway patency
  - → B01: Airway Management
- Provide supplemental oxygen therapy as required
  - → A07: Oxygen Administration
- Correct suspected hypoglycemia
  - For patients with sufficient mentation to maintain an airway, apply glucose gel to oral mucosa
    - Oral 40% Glucose Gel
  - For patients with insufficient mentation or an unprotected airway
    - Glucagon

Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen therapy in patients with clinical signs of hypoxemia or to maintain SpO_2 ≥ 94%
  - → A07: Oxygen Administration
- Correct suspected hypoglycemia

- For patients with sufficient mentation to maintain an airway, apply glucose gel to oral mucosa
  - Oral 40% Glucose Gel
- ☐☐ **Requires completion of EMR scope expansion education:**
  - Glucagon
- Provide safe and expeditious conveyance
- Consider intercept with additional resources

Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access
  - → D03: Vascular Access
- Correct confirmed hypoglycemia:
  - 10% dextrose in water (D10W) IV: 10 to 25 g (100-250 mL)
  - Glucagon if unable to obtain IV access
- Correct hypotension; target systolic blood pressure of 90 mmHg

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- If suspected DKA/HHS:
  - Obtain and interpret 12-lead ECG
    - → PR16: 12-Lead ECG
- Perform continuous cardiac monitoring en route to hospital; electrolyte disturbances may produce arrhythmias
- Exercise caution in DKA when performing advanced airway procedures: tachypnea is the main compensatory mechanism to control acidosis; if intubation is required, select a higher than normal ventilatory rate (use patient's intrinsic rate as a guide)

Community Paramedic (CP) Interventions

CPG CP4.7: Diabetic Follow-up

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Pediatric DKA/HHS follow BC Children's Hospital protocol
- Hypoglycemia
  - Consider Thiamine
- DKA/HHS

1. Replace fluid loss
   - Shock isotonic fluid as quickly as possible.
   - Hypovolemic without shock 15-20ml/kg/hr
   - Euvolemic infused slower guided by clinical assessment.
   - Corrected sodium less than 135 mEq/L continue saline 250-500ml/hr approximately.
   - Normal or elevated corrected sodium switch to one-half saline at 250-500 ml/hr
2. Potassium correction
   - Potassium less than 3.3 mEq/L start KCL 20-40 mEq/hr
   - Potassium between 3.3-5.3 mEq/L KCL 20-30 mEq to maintain the range of 4-5 mEq/L.
   - Potassium greater than 5.3 mEq/L then delay potassium replacement.
3. Insulin infusion
   - Delay insulin if potassium is less than 3.3 mEq/L.
   - Insulin R IV bolus 0.1U/kg followed by 0.1U/kg/hr
   - If glucose is not decreasing after 1 hour and there is no inline filter or extravasation. The insulin infusion may be doubled.
   - When serum glucose approaches 11.1 mmol/L in DKA or 13.9-16.7 in HHS switch saline to D5W and decrease the insulin to 0.02-0.05U/kg/hr. Do not allow the serum glucose to fall below 11.1 in DKA or 13.9-16.7 in HHS.

4. Bicarbonate
   - Call ETP prior to Bicarbonate initiation
   - Not routinely given
   - pH less than or equal to 6.9 give 100 mEq of sodium bicarbonate. If potassium is less than 5.3 mEq/L add 20 mEq KCL.
5. Phosphate
   - Call ETP prior to Phosphate initiation
   - Should not routinely be replaced.
   - If severe hypophosphatemia occurs as defined by 0.32 mmol/L potassium or sodium phosphate 20-30 mEq can be added to 1L of saline.

Evidence Based Practice

Hypoglycemia

Supportive

- D10
- D50W
- Glucagon
- Option to treat and release
- Point of Care Blood Glucose Monitoring

Neutral

- Oral Glucose
- Thiamine

Against

Hyperglycemia

Supportive

Neutral

- Fluid Bolus

Against

References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [Link]
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]
3. American Diabetes Association. Gestational diabetes mellitus. 2004. [Link]
4. Marx JA, et al., editors. Rosen's emergency medicine: Concepts and clinical practice. 8th edition. 2014.
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6. Pasquel FJ, et al. Hyperosmolar hyperglycemic state: A historic review of the clinical presentation, diagnosis, and treatment. 2014. [Link]
7. Tintinalli JE, et al. Tintinalli's emergency medicine: A comprehensive study guide. 9th edition. 2019.
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Practice Updates

- 2023-09-29: added glucagon to FR and EMR interventions

E02: Adrenal Crisis

Richard Armour and Chris Millar

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Introduction

Acute adrenal insufficiency, or adrenal crisis, is a life-threatening endocrine emergency caused by a lack of cortisol (the most common glucocorticoid). Primary adrenal insufficiency is caused by a loss of function of the adrenal gland while secondary adrenal insufficiency is a result of compromised adrenal function, due to a lack of adrenocorticotropic hormone. Patients who are unwell with a past medical history of Addison's disease (the incidence of which varies from 1-6 out of ever 100,000 individuals) should be routinely evaluated for signs of an adrenal crisis; these individuals may carry their own hydrocortisone injections.

Paramedic and EMR/FR treatment for adrenal insufficiency includes the maintenance of airway patency, supporting oxygenation and ventilation, providing adequate fluid resuscitation, correction of hypoglycemia, and the early recognition of these crises leading to the timely administration of hydrocortisone.

Essentials

- In undifferentiated, critically ill patients, routinely assess for a history of Addison's disease or a pre-existing prescription for hydrocortisone injection.
- The administration of a single dose of hydrocortisone to patients with adrenal insufficiency is never harmful. The failure to recognize and treat an adrenal crisis may rapidly result in death.
- In patients with suspected adrenal crisis, hydrocortisone should be administered prior to movement, as some patients may lack a sufficient adrenal reserve to allow for safe transfer to a stretcher.
- Intravenous administration of hydrocortisone is preferred over the intramuscular route. However, IM administration should be provided early when IV access is delayed or unobtainable.
- Patients on long-term (> 3 weeks) glucocorticoid therapy are at risk for secondary adrenal insufficiency.
- Any source of stress (illness, trauma, mental health crisis) in patients with chronic adrenal insufficiency may be sufficient to provoke a crisis.

Additional Treatment Information

- Caution: Patients with suspected adrenal crisis should never be ambulated to the ambulance.
- Hydrocortisone should be administered to patients with suspected adrenal crisis, regardless of whether the patient received hydrocortisone prior to paramedic or EMR/FR arrival.
- Adrenal insufficiency may commonly co-occur with diabetes mellitus. Ensure blood glucose is assessed in all patients with suspected adrenal crisis and treat accordingly.
- In the rare circumstance where a patient with known or suspected adrenal insufficiency also presents with anaphylaxis, administer EPINEPHrine before hydrocortisone.
- Glucocorticoids are used in many chronic medical conditions such as autoimmune disorders, asthma, inflammatory bowel disease, and cancer. In patients with prolonged use of glucocorticoids (3 weeks or more), this may cause suppression of ACTH release, and place the patient at risk of secondary adrenal insufficiency.
- Common glucocorticoids include prednisone, prenisolone, dexamethasone, betamethasone, and hydrocortisone.
- Previous adrenal crisis places the patient at greater risk for future adrenal crises.

General Information

Prior to considering treatment with glucocorticoids, patients must be evaluated appropriately. Hydrocortisone therapy is appropriate in those patients who have:

Signs and symptoms of an adrenal crisis:

- Nausea and vomiting

- Hypoglycemia
- Hypotension
- Weakness
- Dizziness
- Confusion or altered levels of consciousness

And:

- A history of any of:
  - 3 weeks or more of glucocorticoid use
  - Non-compliance or cessation of chronic glucocorticoid therapy (including difficulties with compliance because of nausea/vomiting or prolonged illness)
  - Addison's disease
  - Pituitary insufficiency

And:

- Been prescribed hydrocortisone for management of adrenal insufficiency.

Steroid use should be avoided in patients with acute traumatic head injuries.

Interventions

First Responder

- Position supine to improve blood pressure and do not walk the patient.
- Provide supplemental oxygen as required.
  - → A07: Oxygen Administration

Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen to maintain SpO_2 ≥ 94%.
  - → A07: Oxygen Administration
- May assist patient in administering own hydrocortisone injection if available. Assistance is limited to physically collecting medication. EMRs **must not prepare or administer hydrocortisone.**
- Obtain capillary blood glucose sample; if hypoglycemic:
  - → E01: Hypoglycemia and Hyperglycemia

Primary Care Paramedic – All FR and EMR interventions, plus:

- Consider vascular access for drug administration; do not delay hydrocortisone in cases of failed or difficult vascular access
- → D03: Vascular Access
  - Normal saline to correct hypoperfusion or hypotension
- Dextrose to normalize blood glucose
  - → E01: Hypoglycemia and Hyperglycemia
- ☐☐ **Requires completion of PCP scope expansion education:**
  - Hydrocortisone IV (IM is acceptable if vascular access is unavailable)
  - CliniCall consultation required prior to the administration of hydrocortisone

References

1. Baines A. Adrenal insufficiency: Improving paramedic practice. 2015. [Link]

Practice Updates

- 2023-09-29: enabled guideline

E03: Hyperkalemia

Andrew Mills

Updated: October 26, 2021
Reviewed: March 01, 2021

Introduction

Although there are many potential electrolyte disturbances, hyperkalemia is arguably the most serious. In addition, it may be reasonably identified and treated in the out-of-hospital environment based on clinical features. The strict laboratory testing diagnosis of hyperkalemia is a serum potassium level over 5.5 mmol/L.

In rare cases with signs of hemodynamic compromise and potentially life-threatening arrhythmias, a clinical suspicion of hyperkalemia may be sufficient for initiating treatment.

Essentials

- The lethality of hyperkalemia is directly related to the rapidity with which the condition has developed, in addition to the absolute level of serum potassium.
- Correlation of specific ECG changes with specific serum levels has not been adequately demonstrated.
- Clinical suspicion of hyperkalemia alone is not cause for treatment in the out-of-hospital setting.
- Treatment of life-threatening hyperkalemia aims at preventing or resolving lethal arrhythmias and restoring hemodynamic stability. This can be accomplished by stabilizing the myocardium, shifting potassium back into the intracellular space, and removing excess potassium from the body. The majority of these interventions are only available in hospital.

Additional Treatment Information

- Bradyarrhythmias with bizarre morphologies should prompt a strong consideration of hyperkalemia.
- To warrant out-of-hospital intervention, patients must present with significant hemodynamic or arrhythmogenic instability, alongside a suspicion of hyperkalemia as the likely cause.
- Sodium Bicarbonate should only be used with a suspicion of concurrent underlying metabolic acidosis

General Information

- Classic causes of hyperkalemia:
  - Increased intake, either through potassium supplementation or diet
  - Increased production, as occurs in hemolysis, rhabdomyolysis, extensive burns, intense physical activity, or trauma (particularly crush injuries and tissue ischemia)
  - Decreased excretion, caused by acute or end-stage chronic renal failure, or by some drugs (such as nonsteroidal anti-inflammatory drugs, cyclosporine, potassium-sparing diuretics, and ACE inhibitors)
  - Shifts from intracellular to extracellular fluid as a result of acidosis (either metabolic or respiratory), insulin deficiency, or some drugs (particularly succinylcholine in certain populations, beta blockers, and digoxin)
- Clinical features of hyperkalemia are often non-specific:
  - Generalized muscle weakness, paresthesia and/or absent deep tendon reflexes
  - In rare cases, muscular paralysis and hypoventilation may be observed
  - Mental status change including confusion, fatigue, and lethargy
  - Signs of renal failure, such as edema, skin changes, and dialysis sites, may be present
- The ECG is one of the most important diagnostic tools in detecting hyperkalemia. ECG changes associated with hyperkalemia include:
  - Tall, tented T-waves
  - Flattened or absent P-waves
  - Prolonged PR Interval
  - Wide QRS
  - Bradycardia

- These changes may progress to bizarre QRS complexes, sine waves, or asystole.

Interventions

First Responder

- Keep patient at rest in a position of comfort
- Provide supplemental oxygen as required
  - → A07: Oxygen Administration

Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen to maintain SpO_2 ≥ 94%
  - → A07: Oxygen Administration
- Initiate rapid conveyance
- Consider intercept with additional resources

Primary Care Paramedic – All FR and EMR interventions, plus:

- Consider vascular access for hypotension or hypoperfusion
  - → D03: Vascular Access and Fluid Administration

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Obtain vascular access if not already done.
  - → D03: Vascular Access and Fluid Administration
- In patients with significant hemodynamic instability or dysrhythmia and a suspicion of hyperkalemia:
  - CliniCall consultation required prior to treatment of hyperkalemia.
  - Stabilize cellular action potential:
    - Calcium chloride
      - May repeat after 5 minutes if ECG changes persist or recur
  - Shift potassium intracellularly:
    - Sodium bicarbonate (only with a suspicion of concurrent underlying metabolic acidosis)
    - Salbutamol

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Stabilize cellular action potential:
  - Calcium gluconate IV: 1.0 g slow push over 2-3 minutes; may repeat once after 5 minutes if ECG changes persist or recur
- Shift potassium intracellularly:
  - D10W with 10-20 U insulin R mixed: give 500 mL intravenously over 60 minutes, or:
    - Insulin R 10 units IV followed by glucose 25 g IV
    - Sodium bicarbonate IV: 150 mEq in 1 L D5W over 2-4 hours depending on volume status
- Eliminate potassium:
  - Furosemide IV: 40 mg every 12 hours
- Consider Kayexalate
  - 30-60 g PO

References

1. Mount DB. Treatment and prevention of hyperkalemia in adults. In UpToDate. 2019. [Link]
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E04: Dialysis Emergencies

Michelle Haig and Rebecca Kroeker

Updated: January 31, 2024
Reviewed: March 01, 2021

Introduction

Patients who suffer from an acute or chronic injury or illness to their kidneys are at risk of developing kidney failure. Treatment options depend upon the patient's clinical condition and comorbidities, ranging from conservative treatment with medication and fluids, to peritoneal dialysis, hemodialysis, or kidney transplantation.

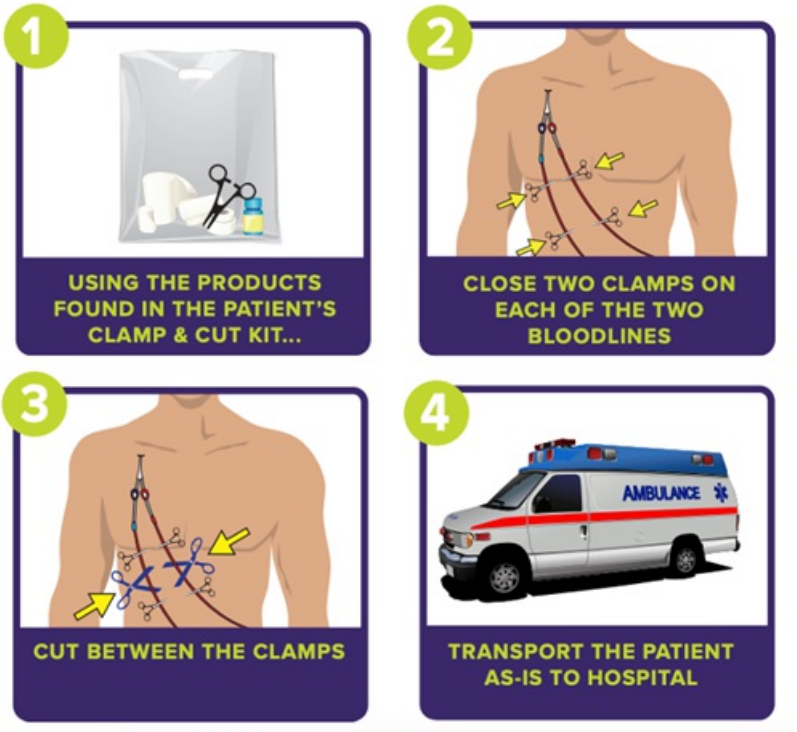
Essentials

- Patients requiring renal dialysis often have numerous other medical problems, including hypertension, diabetes, and cardiovascular disease. Paramedics and EMRs/FRs should be alert to the possibility of concurrent clinical issues.
- Do not attempt to take blood pressures, or initiate intravenous access, in an extremity that has a dialysis shunt or fistula in place.
- Always consider the possibility of hyperkalemia in patients on dialysis or with renal failure.
- Dialysis patients should be conveyed preferentially to a facility capable of providing dialysis services. If the patient is critically ill, convey the patient to the nearest facility. Contact CliniCall for assistance with appropriate clinical pathway.

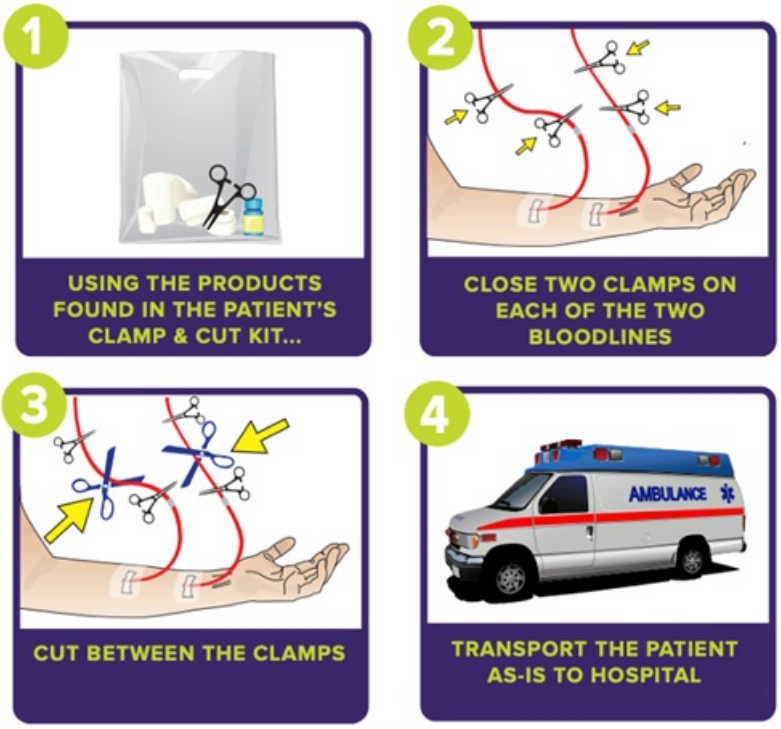
Additional Treatment Information

Emergency Disconnect Instructions

For dialysis patients with a central catheter:



For patients with a fistula or graft:



Referral Information

It may be reasonable to bypass the emergency department in favour of conveyance to the patient's dialysis clinic. CliniCall consultation recommended to discuss care planning and conveyance options.

General Information

- Peritoneal dialysis uses the peritoneal membrane in the body itself as a filter. This membrane is a fine layer of tissue lining the peritoneal cavity. The peritoneal cavity's rich vascular supply makes the peritoneal membrane ideal for filtering metabolic wastes and excess fluid from the blood. Dialysis solution is instilled into the abdominal cavity via a surgically inserted Tenckhoff Catheter. Metabolic waste products then pass from the bloodstream, across the peritoneal membranes, and into the dialysis solution. After a period of dwelling time, the solution is drained from the peritoneal space and replaced with a fresh solution.
- In hemodialysis, blood is pumped from the body through special tubing into a dialysis machine via a surgically inserted catheter or arterio-venous (AV) fistula. This typically occurs 3 or 4 days per week at a dialysis centre but can also be performed daily at home. A hemodialysis machine removes waste products and excess fluid from the blood and, as such, acts as a type of artificial kidney. The blood passes through a dialyser (filter), which also assists in balancing fluids and electrolytes in the blood. The machine then returns the filtered and cleansed blood to the body at the same rate at which it was removed.
- Patients undergoing hemodialysis will have a long-term catheter or shunt placed for this procedure. Catheters are typically placed in the upper chest and shunts are typically placed in an arm or forearm. The shunt is created by anastomosing a vein and an artery; turbulence can be felt on the shunt when it is palpated and a bruit can be heard when it is functioning properly.
- Common complications of dialysis treatment include:
  - Infection at the shunt or catheter site, or systemically
  - Disequilibrium syndrome develops when a shift of metabolic waste and electrolytes occurs, causing weakness, dizziness, nausea and/or vomiting, and seizures
  - Hypotension can cause altered LOC, angina, seizures, or arrhythmia, and typically responds to a small fluid bolus of 250 mL normal saline
  - Occlusion or disruption of the Tenckhoff catheter
  - Some medications are filtered out by the dialyser, limiting their therapeutic effect
  - Air embolism
  - Shunt bleeding typically following a hemodialysis session, which will occur in 1 to 4 tiny holes made by needles

- To treat, apply direct pressure to control. When the bleeding stops, tape over the gauze but do not remove the gauze to check for control as this will usually cause more bleeding. Circumferential dressings, if used, should not be used as this can occlude the shunt and cause clotting. The tape should, at a maximum, envelope about 180 degrees of the extremity.

Interventions

First Responder

- Keep patient at rest
- Control bleeding as required
- Position patient based on comfort and prevent heat loss

Emergency Medical Responder – All FR interventions, plus:

- Convey in position of comfort
  - CliniCall consultation recommended to discuss care planning and conveyance options.
- If at a dialysis facility, engage with staff to provide appropriate care to patient
  - CliniCall consultation required prior to initiating treatment or emergency disconnection procedures.
- If patient is attached to a home dialysis machine *and* is critically ill:
  - CliniCall consultation required prior to initiating treatment or emergency disconnection procedures.

Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access
  - → D03: Vascular Access
  - Normal saline if systolic blood pressure is < 90 mmHg or if signs of end-organ hypoperfusion exist
- Correct hypoglycemia
  - → E01: Hypoglycemia and Hyperglycemia

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- In patients with significant hemodynamic instability or dysrhythmia and a suspicion of hyperkalemia
  - → E03: Hyperkalemia

References

1. Mount DB. Treatment and prevention of hyperkalemia in adults. In UpToDate. 2019. [Link]
2. North Carolina Office of EMS. Dialysis/Renal Failure. 2012. [Link]
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E05: Abdominal Pain

Sheena Osborne

Updated: May 25, 2021
Reviewed: March 01, 2021

Introduction

Abdominal pain is one of the most common out-of-hospital complaints and features a broad and varied list of potential causes, ranging from benign to life threatening. In the absence of laboratory testing and diagnostic imaging, it can be extremely difficult to differentiate between causes of abdominal pain.

Common origins for abdominal pain can include biliary tract diseases, appendicitis, peptic ulcers, diverticulitis, acute gastroenteritis, renal colic, urinary tract infections, gastroesophageal reflux disease, constipation, bowel obstruction, and many others. When examining a patient with abdominal pain, paramedics and EMRs/FRs must be aware that the pain may be originating from outside of the gastrointestinal system. Consider cardiac, urinary, reproductive, respiratory, and toxicological origins in these cases.

The out-of-hospital care of abdominal pain centres on the early identification of life-threatening causes, the management of symptoms and physiological dysfunction, and improving patient comfort.

Essentials

- Identify and communicate potentially life-threatening causes of abdominal pain.
- Identify and correct hypovolemia.
- Provide symptom relief.

Additional Treatment Information

- Fluid replacement should be considered if clinical signs of dehydration or hypovolemia are present. These can include dry mouth or tongue, poor skin turgor (i.e., tenting), and a history of diminished oral intake or fluid loss (vomiting, diarrhea).
- Manage nausea and vomiting. Paramedics and EMRs/FRs should be particularly alert to the presence of blood or 'coffee ground' emesis. Maintain patient dignity and comfort during episodes of nausea and vomiting.
- Consider assessing blood glucose levels in cases of prolonged vomiting, anorexia, or limited oral intake.
- Practitioners should ensure that acute abdominal pain is managed adequately with analgesic medications. Strong evidence supports the use of narcotic analgesics in this patient population. Use of analgesia does not affect the accuracy of in-hospital assessment or diagnosis.

General Information

- Use appropriate personal protective equipment. Contact precautions may be warranted in patients who exhibit signs and symptoms consistent with infectious causes of abdominal pain. Fever, nausea and vomiting, loose stools or diarrhea, myalgia, and headache may be the result of norovirus infection. Refer to BCEHS Infection Control and Prevention material for additional guidance on the selection and use of personal protective equipment.
- Potentially life-threatening causes of abdominal pain or discomfort include:
  - *Aortic aneurysm or dissection* is sometimes accompanied by a known history of aneurysm, or pain characterized as ripping or tearing, with radiation to the back. It may correspond to a syncopal event. Pain from an aortic dissection is generally above the diaphragm, and may manifest itself as chest or back pain. Leaking or disrupted abdominal aortic aneurysms produce pain below the diaphragm.
    - → C05: Acute Aortic Dissection
  - *Acute coronary syndromes* can manifest as pain above the umbilicus and should be considered in all patients over the age of 35.
    - → C01: Acute Coronary Syndrome
  - A *perforated abdominal viscus* is often associated with a history of peptic ulcer disease or diverticulitis. It is characterized by the rapid onset of abdominal pain accompanied by abdominal rigidity, guarding, and rebound tenderness. Patients are commonly febrile and nauseated.

- Although uncommon, *ectopic pregnancies* should be considered in any woman of childbearing age with lower abdominal quadrant pain. A syncopal event, associated with abdominal pain in this population, is suggestive of a ruptured ectopic pregnancy.
- *Mesenteric ischemia* should be suspected in patients who have a sudden onset of severe pain which can be disproportionate to the physical findings. Atrial fibrillation and prior cardiovascular disease are risk factors. The mortality rate can be as high as 70%.
- Constant pain in the epigastrum radiating to the back should prompt a consideration of *pancreatitis*. Risk factors include alcohol abuse and biliary tract disease. Consider the possibility of diabetic ketoacidosis in Type 1 diabetics.
- Abdominal pain associated with dark, tarry stools, or frank blood in stool or emesis, is suggestive of a *gastrointestinal hemorrhage*. Significant quantities of blood can be lost through gastrointestinal bleeding; watch for signs of hypotension.
- *Anaphylaxis* can provoke abdominal pain, cramping, nausea, vomiting, and diarrhea.
  - → E09: Anaphylaxis
- Abdominal pain can also be associated with *sepsis*
  - → K02: Sepsis

Interventions

First Responder

- Place patient in position of comfort where possible
- Prevent heat loss
- Provide supplemental oxygen as required
  - → A07: Oxygen Administration

Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen to maintain SpO_2 ≥ 94%
  - → A07: Oxygen Administration
- Consider analgesia:
  - → E08: Pain Management
    - Nitrous oxide (self-administered) to effect
    - Nitrous oxide should be used with caution in abdominal pain as the gas has a tendency to diffuse into air-filled spaces; its use is contraindicated in patients with gross abdominal distension

Primary Care Paramedic – All FR and EMR interventions, plus:

- Obtain vascular access:
  - → D03: Vascular Access
  - Consider volume replacement to correct hypotension; target systolic blood pressure of 90 mmHg
- Consider symptom relief for ongoing nausea or active vomiting
  - → E07: Nausea and Vomiting
    - DimenhyDRINATE

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Obtain and interpret 12-lead ECG in patients over 35 and pain above the umbilicus
  - → PR16: 12-Lead ECG
  - → C01: Acute Coronary Syndrome
- Consider symptom relief for ongoing nausea or active vomiting
  - → E07: Nausea and Vomiting
- Consider analgesia
  - FentaNYL

Evidence Based Practice

Abdominal Pain

Supportive

- Analgesia (narcotic)
- Fentanyl
- Ketamine
- Analgesia (NSAIDs)
- Nitrous Oxide

Neutral

Against

References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [Link]
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]
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E06: Non-Traumatic Back Pain

Christiana Gregory and Marc Gessaroli

Updated: February 04, 2022
Reviewed: February 04, 2022

Introduction

Approximately 84% of adults will experience back pain at some point in their lives. Episodes of non-traumatic back pain are mostly self-limited and are most often not indicative of a serious medical condition. Acute non-traumatic back pain, as defined by an episode of pain less than four weeks in length, can generally be managed in the primary care setting. However, a small percentage of patients will have serious, potentially life-threatening causes of back pain; careful history taking and physical examination are required to identify conditions such as cauda equina syndrome, abdominal aortic aneurysmal leak, vertebral infections, and spinal fractures.

Essentials

- Paramedics and EMRs/FRs must rule out life-threatening causes of back pain. Foremost among these is cauda equina syndrome, but conditions that can produce back pain as a symptom must be considered as well, particularly leaking aortic aneurysms and peritoneal bleeding.
- Patients should receive analgesia whenever possible.

Additional Treatment Information

- Acetaminophen is considered safe and effective pain management. Nitrous oxide, fentaNYL, and ketAMINE may facilitate conveyance in cases of severe pain and discomfort.

Referral Information

Eligible patients may be referred to Urgent and Primary Care Centres in specific areas using the Non-Traumatic Back Pain assess, see, treat and refer pathway.

General Information

- The most serious cause of back pain is *cauda equina syndrome*. This is a condition where the nerve roots in the lower spinal cord become compressed. Cauda equina syndrome can have a fast or slow onset. Signs and symptoms of cauda equina include:
  - 'Saddle' anesthesia (an altered sensation around the groin and inner thigh, as would be in contact with a saddle while riding a horse)
  - Leg weakness or numbness (can affect either leg or both)
  - Bowel and bladder incontinence (considered a late finding)
- Infections of the vertebrae should be considered if the patient has a history of fever or recent infection, is immunocompromised, or has used intravenous drugs

Interventions

First Responder

- Assist patient to position of comfort
- Consider ice/heat packs

Emergency Medical Responder – All FR interventions, plus:

- Provide appropriate analgesia
  - → E08: Pain Management

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- See procedural analgesia

Evidence Based Practice

Mechanical Back Pain

Supportive

- Ketamine
- Morphine
- Fentanyl
- Nitrous Oxide

Neutral

- Benzodiazepines

Against

References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [Link]
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]

Practice Updates

- 2022-02-03: Added Non-Traumatic Back Pain ASTaR information.

E07: Nausea and Vomiting

Marc Gessaroli and Christiana Gregory

Updated: March 22, 2024
Reviewed: September 29, 2023

Introduction

Nausea is the unpleasant, disabling, and painless urge to vomit. It can exist independently or be accompanied by vomiting. The potential causes for nausea and vomiting are extensive; nausea and vomiting are not considered diseases in and of themselves but rather symptoms of other conditions. In caring for individuals with nausea and/or vomiting, paramedics and EMRs/FRs should work towards two goals: identification of the underlying cause to determine appropriate treatment and the management of symptoms to improve patient comfort.

Essentials

- An attempt at identifying acute etiologies for nausea and vomiting must be made.
- Provide therapies to alleviate symptoms.
- Facilitate appropriate conveyance.

Additional Treatment Information

- Intramuscular (IM) dimenhydrinate is a safe and effective anti-emetic. It should only be used for nausea that is actually present and not be considered for prophylaxis.
- Ondansetron is an effective anti-emetic for nausea and vomiting secondary to radiation, chemotherapy, surgery, and gastroenteritis. It provides little relief from motion sickness.
- Dimenhydrinate must be used with caution for head injuries as it may cause further CNS dysfunction. Ondansetron is preferred in these patients as control of vomiting is important to limit the increase in intracranial pressure.
- Look for the following signs of dehydration: postural perfusion changes including tachycardia; hypotension or dizziness; decreased sweating and urination; poor skin turgor; dry mouth/tongue; fatigue; altered consciousness; and evidence of poor fluid intake compared to fluid loss. Dehydrated patients are candidates for volume replacement.
- Older adults may be more sensitive to the side effects of dimenhyDRINATE, especially drowsiness, confusion, constipation, or trouble urinating. Drowsiness and confusion can increase the risk of falling. Reduce the dosage administered to elderly or frail patients.

General Information

- A complete physical and neurological assessment should be completed for all patients. Acute etiologies may include but are not limited to:
  - Myocardial infarction
    - → C01: Acute Coronary Syndrome
  - Cerebrovascular accident
    - → F03: Stroke
  - Sepsis
    - → K02: Sepsis
  - Gastrointestinal bleeding
  - Meningitis
  - Ischemic bowel
  - Diabetic ketoacidosis
    - → E01: Hypoglycemia and Hyperglycemia
  - Overdose or drug toxicity (consider adverse drug reactions)
  - Carbon monoxide poisoning
    - → J02: Carbon Monoxide

- Common causes of nausea and vomiting include:
  - Vertigo: One of the most common causes of out-of-hospital nausea/vomiting, this is the perceived sensation of motion often described as spinning or whirling. Sweating, pallor, nausea, vomiting, and balance disturbances often accompany vertigo. Vertigo is caused by many different factors including:
    - Impaired visual input, inner ear function, or peripheral sensory input
    - CNS impairments (e.g., alcohol, prescription drugs)
    - Disease (e.g., Meniere's disease)
  - Migraines: These headaches can last from minutes to days and are characterized by intense throbbing pain, photosensitivity, nausea and vomiting, and sweating. Patients may be prescribed metoclopramide as it treats both the pain and nausea associated with suspected migraines.
  - Opioid-induced: Due to the low incidence of opioid-induced nausea, the lack of efficacy of prophylactic therapy, and the possibility of additional side effects, opioids should not be accompanied by an antiemetic agent. Antiemetic therapy is only indicated if the patient develops nausea or vomiting after opioid use.
  - Alcohol withdrawal: Patients experiencing alcohol withdrawal are at higher risk of developing electrolyte abnormalities which can affect the QT interval. Dimenhydrinate is the antiemetic of choice in these cases as it does not cause QT interval elongation.
  - Upper gastrointestinal bleeding: Blood in the stomach is often a cause of extreme nausea. Metoclopramide can be useful in these cases as it improves gastric emptying in addition to treating nausea.
  - Pregnancy: Nausea can be a common issue during pregnancy, especially in the first trimester and in the morning. Dimenhydrinate is considered to be the first-line medication for nausea and vomiting that is safe and effective during pregnancy. Women should be reassured as to dimenhydrinate's safety and low risk of toxicity for the fetus.

Interventions

First Responder

- Keep the patient at rest in a position of comfort
- Maintain patient in position of comfort consistent with the need to protect the patient's airway
  - → B01: Airway Management

Emergency Medical Responder – All FR interventions, plus:

- Convey patient in position of comfort consistent with the need to protect the patient's airway
  - → B01: Airway Management

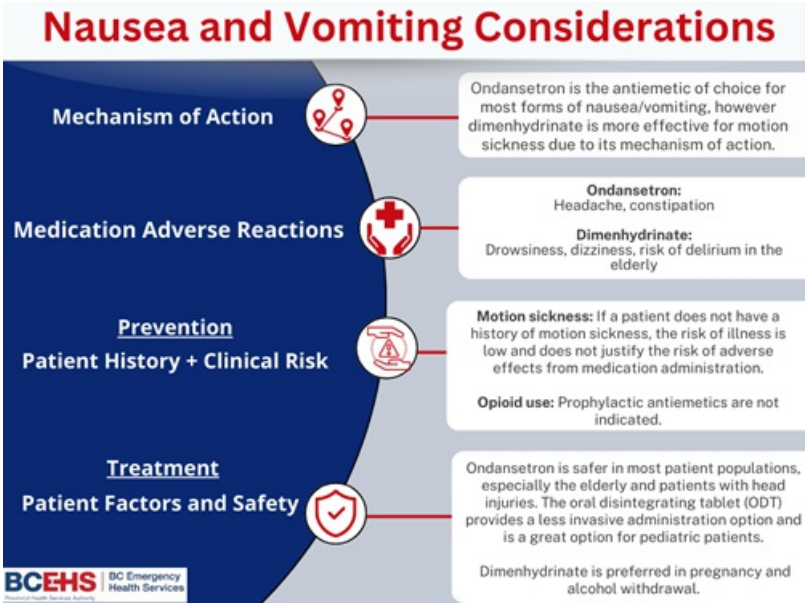
Primary Care Paramedic – All FR and EMR interventions, plus:

- Consider vascular access
  - → D03: Vascular Access
- Consider dimenhyDRINATE
- Consider ondansetron
- □□ **PCP and ACP: requires completion of scope expansion education or other appropriate BCEHS-specific education**
- Treat hypotension from volume loss:
  - Normal saline 500 mL bolus to a maximum of 2 L
  - Reassess after every bolus; target systolic blood pressure of 90 mmHg

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Consider Zofran
- Consider Metoclopramide
- Consider Stemetil

Algorithm



Patient Characteristic	DimenhyDRINATE	Ondansetron
Head Injury	⚑ Must be used with caution as it may cause further CNS dysfunction.	✅ Preferred in these patients as control of vomiting is important to limit the increase in intracranial pressure.
Older Adults	⚑ Older adults may be more sensitive to the side effects of dimenhyDRINATE, such as drowsiness, confusion, constipation, or trouble urinating.	✅ Due to these risks, and the American Geriatric Society's (AGS) Beers criteria, ondansetron should be the antiemetic of choice in the elderly populations, if etiology permits.
Pregnancy	✅ Preference is given to dimenhyDRINATE for nausea and vomiting during pregnancy. Pregnant patients should be reassured that dimenhyDRINATE is safe and low risk of toxicity for the fetus.	⚑ Use of ondansetron in early pregnancy (first trimester) is controversial.
Alcohol Withdrawal	✅ The preferred antiemetic due to its lack of QT interval elongation side effects, in contrast to ondansetron. This distinction is important, especially when dealing with electrolyte imbalances in alcohol withdrawal.	⚑ Has QT interval elongation side effects unlike dimenhyDRINATE.

Evidence Based Practice

Nausea and Vomiting

Supportive

- Antiemetic (Central)
- Antiemetic (GI Action)
- Isopropyl alcohol

Neutral

Against

References

1. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]
2. American Gastroenterological Association. Medical position statement: Nausea and vomiting. 2001. [Link]

Practice Updates

- 2023-09-29: added ondansetron to PCP interventions

E08: Pain Management

Dugg Steary

Updated: December 19, 2023
Reviewed: February 06, 2023

Introduction

The relief of pain is one of the most significant and meaningful interventions paramedics and EMRs perform in the out-of-hospital setting. It is expected that paramedics and EMRs will provide timely and effective pain management to all patients in their care. Controlling pain can calm patients and assist in the assessment and management of other clinical problems. The demeanour and language used by paramedics and EMRs can dramatically influence the efficacy of any analgesic strategy - even opioid-based analgesia will not work if patients do not trust their providers

Essentials

- Always use a progressive and multimodal approach to controlling your patient's pain. Non-medication strategies have proven effects to decrease patient pain. Always progress from the simplest to the more invasive or complicated medication deliveries. Do not forgo basic strategies in favour of more complicated approaches.
- As part of a progressive and multimodal approach, consider all benefits and effects of interventions as part of your patient's pain management. For example, with the knowledge that acetaminophen and ibuprofen have the same effects as an opioid medication but take longer for effect, administer early and bridge with another medication (eg. nitrous oxide) while awaiting the onset.
- Typical measures should always include reassurance, gentle handling, control of temperature, positioning of the patient or limbs, and splinting of injured limbs.
- As interventions are applied, continue to assess and record their effects.
- An inability to report or rate pain should not preclude analgesia. Where discomfort is evident in the setting of potentially painful stimuli, consider options for analgesia. The pain ladder is an effective tool to assist in rating the patient's pain and response to pain management.

Additional Treatment Information

- When combined with positive reinforcement, nitrous oxide (Entonox) is an effective analgesic. It is the agent of choice in many countries for use in childbirth. The contraindications to the use of nitrous oxide are the result of the pathophysiology of gas exchange and absorption (primarily the trapping of gas and the development of hypoxia).
- Nitrous oxide can cause rebound hypoxemia due to the displacement of oxygen from the alveoli as it diffuses out of the bloodstream. Supplemental oxygen following the use of nitrous oxide will prevent the development of this hypoxemia and should be provided to all patients.
- Acetaminophen daily maximum dose is not to exceed the lesser of 75 mg/kg or 3,000 mg in a 24-hour period. This ***includes*** any medications containing acetaminophen that was consumed prior to paramedic administration.
- Methoxyflurane (Penthrox) daily maximum dose is 6 mL in a 24-hour period. This dose includes any provided by first responders e.g. ski patrol and cannot be exceeded.
- Methoxyflurane (Penthrox) is contraindicated in known ***or*** suspected pregnant patients
- Fentanyl is an opioid analgesic. It is generally less prone to causing hypotension than morphine, though a drop in blood pressure is likely once adequate analgesia is achieved due to a reduction in overall sympathetic stimulation. Fentanyl ***does not*** provide a greater degree of analgesia than morphine.
- Ketamine provides excellent analgesia, sedation, and dissociation dependent on dosing. As an analgesic, ketamine has significant advantages in the out-of-hospital setting: it allows the patient to breathe spontaneously, maintain many of their own protective airway reflexes, and tends to elevate blood pressure through the release of catecholamines.

General Information

- Approach each call with a view to assessing a patient's pain and exploring ways to help alleviate it.

- Every intervention and medication has important side effects. Some of these may actually worsen a patient's pain or experience. Always use interventions most likely to provide positive assistance.
- As interventions are applied, continue to assess and document the effects of the interventions by measuring the patient's pain. In cases where patients are unable to describe their pain effectively (because of language barriers, altered levels of consciousness, age, or dementia), other signs of pain must be monitored. Consider the use of facial expressions, the guarding of limbs, tears or crying, moaning, restlessness, heart rate, and blood pressure – all may provide clues and allow paramedics and EMRs to manage pain more effectively.
- In special populations, specific pain assessment tools may be useful. Consider the FLACC scale in children or the Abbey scale in adults with dementia.

Interventions

First Responder

- **Adult and Pediatric Patients (all pain levels):**
  - Non-medication management
    - Keep the patient at rest in a position of comfort, and provide reassurance
    - Splint/support any injured extremity
    - For injuries, consider ice packs or heat packs applied to the injury site in conjunction with elevation where clinically appropriate

Emergency Medical Responder – All FR interventions, plus:

Adult patients (MILD pain level):

- Non-medication management
- Nitrous Oxide (Entonox)
- Acetaminophen
- Ibuprofen

Adult patients (MODERATE or SEVERE pain level)

- Non-medication management
- Nitrous Oxide (Entonox)
- Acetaminophen
- Ibuprofen
- Methoxyflurane (Penthrox)

Always use a progressive and multimodal approach to controlling your patient's pain.

Primary Care Paramedic – All FR and EMR interventions, plus:

- Nausea associated with the administration of methoxyflurane is rare and there is no need to routinely administer anti-emetics prior to analgesia. Anti-emetics may be considered if nausea develops during administration:
  - DimenhyDRINATE
- Acetaminophen IV (***currently on hold***)
- Consider need for palliative approaches for patients with life-limited illnesses:
  - → CPG P03: Palliative Care - Pain

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

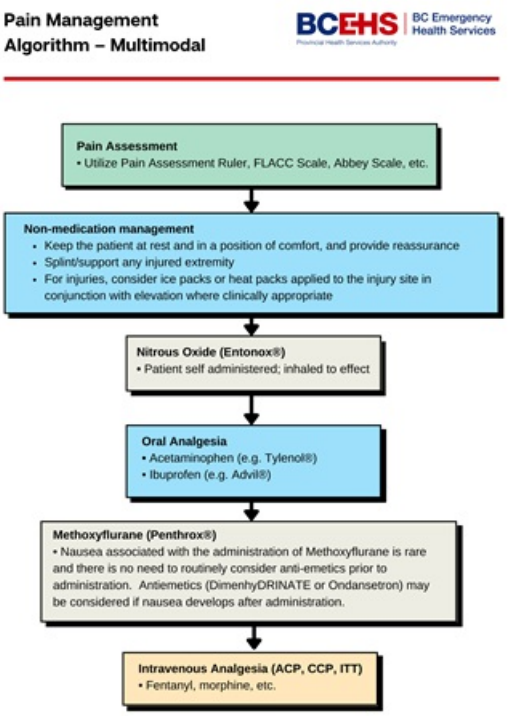
- FentaNYL
- KetAMINE
- MORPHine

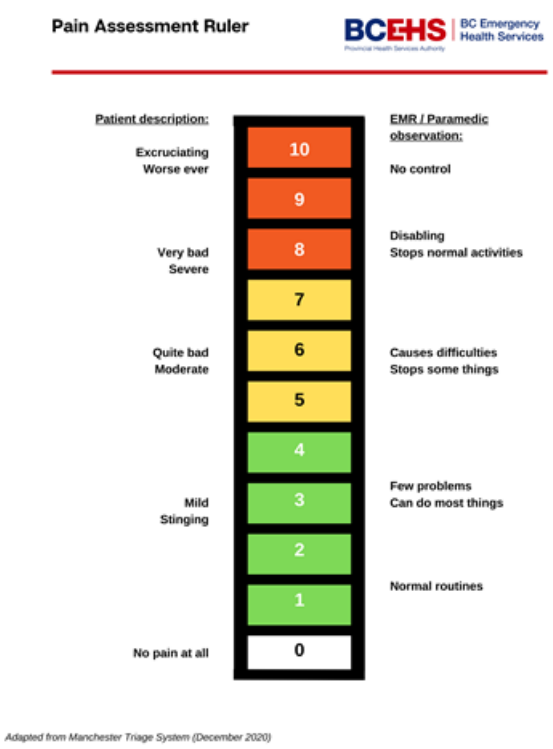
- Nausea associated with the administration of fentaNYL and ketAMINE is rare and there is no need to administer anti-emetics prior to analgesia; they may be considered if nausea develops after administration:
  - DimenhyDRINATE
  - Ondansetron

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- HYDROmorphone
- KeTORolac

Algorithm





Evidence Based Practice

Analgesia

Supportive

- Acetaminophen IV
- Acetaminophen PO
- Fentanyl
- Ketamine
- Ketorolac (Toradol)
- Methoxyflurane (Penthrox)
- Morphine
- Nitrous Oxide
- NSAIDs

Neutral

Against

- Benzodiazepines

References

1. Derry CJ et al. Single dose oral ibuprofen plus paracetamol (acetaminophen) for acute postoperative pain. 2013. [Link]
2. Krebs EE et al. Effect of opioid vs nonopioid medications on pain-related function in patients with chronic back

pain or hip or knee osteoarthritis pain the SPACE randomized clinical trial. 2018. [Link]

3. Lindbeck G et al. Evidence-based guidelines for prehospital pain management: recommendations. 2022. [Link]
4. Sobieraj DM et al. Comparative effectiveness of analgesics to reduce acute pain in the prehospital setting. 2020. [Link]
5. Teater D. Evidence for the efficacy of pain medications. n.d. [Link]

Practice Updates

- 2023-02-06: updated guideline to reflect changes to scope of practice for EMRs and introduction of methoxyflurane into practice.
- 2023-02-13: fixed spelling error

E09: Anaphylaxis

Joe Acker

Updated: December 19, 2023
Reviewed: September 29, 2023

Introduction

Allergic reactions range from localized urticaria to life-threatening anaphylaxis. Anaphylaxis is the most severe form of an immediate hypersensitivity reaction and encompasses both IgE-mediated reactions and anaphylactoid reactions; the latter do not require previous sensitizing exposures. Paramedic and EMR/FR management of anaphylaxis includes maintenance of the airway, breathing, and circulation with epinephrine the primary therapeutic intervention.

Essentials

- Intramuscular administration of EPINEPHrine is indicated for initial care of a patient with systemic signs of anaphylaxis. The anterolateral mid-thigh is the preferred site due to improved absorption.
- Intravenous EPINEPHrine should be reserved for the patient who is extremely hypoperfused or facing impending cardiac arrest.
- Intravenous EPINEPHrine should only be considered after intramuscular EPINEPHrine.
- A patient's own EPINEPHrine auto-injector is an appropriate treatment for anaphylaxis and EMRs can administer a patient's EPINEPHrine autoinjector when associated with signs and symptoms of anaphylaxis.
- Death from anaphylaxis is far more likely to be associated with a delay in management rather than an inadvertent administration of EPINEPHrine.

Additional Treatment Information

- DiphenhyDRAMINE is not effective in life-threatening anaphylaxis. It must not be administered instead of EPINEPHrine. Antihistamine use is intended for controlling urticarial symptoms to improve patient comfort.
- Some patients, particularly those taking beta-blocking medications, will be unresponsive to EPINPEHrine. In consultation with CliniCall, paramedics may elect to give glucagon 1-2 IU IM or IV. Glucagon administration must not delay additional EPINEPHrine.
- Some patients will present with predominant respiratory symptoms of dyspnea and wheezing. Treating with salbutamol for bronchodilation is acceptable if EPINEPHRine has been ineffective. It should only be used after EPINEPHrine administration and not as a first line treatment.
- Patients who are persistently hypoxic and whose condition does not improve following repeated epinephrine doses may require assisted ventilation and advanced airway management. These procedures may be extremely difficult due to distortion of the airway, primarily due to angioedema. Slow, low pressure bag-valve mask ventilation, with sufficient time for exhalation (similar to ventilation in asthma) will improve air flow through bronchioles. Ventilation rates and tidal volumes typically used in patients with respiratory failure can cause serious complications in anaphylaxis: gastric distension; vomiting; pneumothorax; and worsening hypotension can result from high pulmonary pressures.
- Nebulized EPINEPHrine has been used in cases where there is significant airway edema compromising management in addition to IM EPINEPHrine, but there is little data to support its routine use. Nebulized EPINEPHrine must never delay, or substitute for, IM EPINEPHrine.
- The benefit of corticosteroids in anaphylaxis is unproven. Nonetheless, it is common practice to prescribe a 2-day course of oral steroids (e.g., oral prednisolone 1 mg/kg, maximum 50 mg daily) to hopefully reduce the risk of symptom recurrence after a severe reaction or a reaction with marked or persistent wheeze.
- ***Cardiac arrest considerations:***
  - Cardiac arrest may result from angioedema with upper and lower airway obstruction. Immediate cricothyrotomy may be necessary.
    - → PR22: Surgical Airways
  - Severe anaphylaxis may produce profound vasodilation requiring significant volume replacement.

Referral Information

All patients with suspected anaphylaxis must be advised that they should be conveyed to hospital regardless of the severity of their presentation or response to management. International guidelines recommend at least 4 hours of observation following treatment.

General Information

- The patient's history can include exposure to an allergen such as food, bites/stings, medications, or the allergen may be unknown.
- Exposure to an allergen results in the release of inflammatory mediators from mast cells and basophils which cause the signs and symptoms of anaphylaxis. While there are a number of mediators, histamine is the most widely recognized.
- Anaphylaxis is a rapid onset, multiple-organ, generalized hypersensitivity (allergic) syndrome. It is usually characterized by exposure to a known or suspected allergen with a sudden onset of symptoms and at least 1 of the following R.A.S.H. signs/symptoms:
  - **R**espiratory distress (dyspnea, wheeze, cough, stridor)
  - **A**bdominal symptoms (nausea, vomiting, diarrhea, abdominal pain/cramps)
  - **S**kin/mucosal symptoms (hives, welts, itch, flushing, angioedema, swollen lips/tongue)
  - **H**ypotension (or hypoperfusion or altered conscious state)
- In rare circumstances, anaphylaxis can occur with symptoms in an isolated body system. If a patient has hypotension following exposure to a known allergen, consider treating as anaphylaxis.
- Allergic reactions may range in severity from mild, with only a rash, to life threatening. The degree of severity depends on the body's response to the allergen. The tendency is for reactions to increase in severity over time as the body becomes increasingly sensitive and primed to the allergen.

Interventions

First Responder

- Position supine to improve blood pressure and do not walk the patient
- Remove allergen (e.g., scrape off any stinger(s) / stop drug administration)
- Prevent or reverse progression to life-threatening manifestations:
  - EPINEPHrine via autoinjector (EpiPen)
- Provide supplemental oxygen and airway management as required
  - → A07: Oxygen Administration
  - → B01: Airway Management

Emergency Medical Responder – All FR interventions, plus:

- Convey early
- Consider intercept with additional resources
- **Requires completion of EMR scope expansion education:**
  - Prevent or reverse progression to life-threatening manifestations
    - EPINEPHrine
  - **Note:** EMRs must complete EMR-specific scope of practice expansion education prior to EPINEPHrine use (FR scope expansion material is insufficient for BCEHS practice)

Primary Care Paramedic – All FR and EMR interventions, plus:

- Prevent progression to life-threatening manifestations
  - EPINEPHrine
- Treat bronchospasm **after** EPINEPHrine has been administered
  - Salbutamol
- Consider vascular access and fluid administration if patient remains hypotensive or hypoperfused

- → D03: Vascular Access

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- EPINEPHrine IV/IO if refractory to other routes of EPINEPHrine
- Consider glucagon for persistent hypotension despite fluids and EPINEPHrine in patients taking ACE inhibitors or beta blockers
  - CliniCall consultation recommended to discuss dosing strategies.
- Consider diphenhyDRAMINE to mitigate medium-term effects and limit histamine response
- Intubation or FONA if unable to oxygenate and ventilate; KetAMINE is the preferred induction agent in anaphylaxis
  - → PR18: Anesthesia Induction
  - → PR22: Surgical Airways

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Mechanical ventilation strategies
- An H_2 antihistamine given with an H1 antihistamine may provide some additional relief of urticaria

Evidence Based Practice

Anaphylaxis

Supportive

- H2 Blocker with Diphenhydramine
- Diphenhydramine
- Epinephrine
- Crystalloid Infusion

Neutral

Against

References

1. Alberta Health Services. AHS Medical Control Protocols. 2020. [Link]
2. Ambulance Victoria. Clinical Practice Guidelines: Ambulance and MICA Paramedics. 2018. [Link]
3. Australasian Society of Clinical Immunology and Allergy. ASCIA Guidelines - Acute management of anaphylaxis. 2020. [Link]
4. Choo KJL et al. Glucocorticoids for the treatment of anaphylaxis: Cochrane systematic review. 2010. [Link]
5. Tintinalli JE, et al. Tintinalli's emergency medicine: A comprehensive study guide. 9th edition. 2019.

Practice Updates

- 2023-09-29: added autoinjector epinephrine to FR interventions; added epinephrine to EMR interventions

E10: Minor Allergy

Laurence Darlington and Kristen Steary

Updated: February 04, 2022
Reviewed: February 04, 2022

Introduction

Allergic reactions are a hypersensitivity response by the immune system to an allergen and can range from localized urticaria to life-threatening anaphylaxis. Minor allergic reactions are typically localized to the integumentary system and are not systemic reactions (as observed in anaphylaxis). Minor allergies present with urticaria and pruritus and can be managed by antihistamine administration in the out-of-hospital environment for patient comfort. Refer to E09: Anaphylaxis for patients with a suspected allergic reaction presenting with concurrent respiratory, cardiovascular, or gastrointestinal complaints.

Essentials

- Minor allergic reactions involve the integumentary system with the presence of urticaria and occasionally mild, localized edema. Minor reactions do not involve any other system (e.g., cardiovascular, respiratory, or gastrointestinal systems).
- Urticaria consists of transient wheals on the skin (raised areas of various sizes, with or without erythema) with pruritus and/or burning sensations. If a patient presents with dermatologic symptoms plus any of hypotension/hypoperfusion, angioedema, respiratory distress, and/or gastrointestinal upset, more aggressive intervention is required.
  - → E09: Anaphylaxis
- Minor allergic reactions are typically managed by removal of the allergen (e.g., removing a stinger or washing a topical lotion from the skin using soap and water) and antihistamine administration (e.g., diphenhydrAMINE).
- EPINPEHrine should not be administered in a minor allergic reaction that involves only the integumentary system.

Additional Treatment Information

- Oral antihistamines are typically sufficient for management of minor allergic reactions. If PO medications cannot be tolerated, diphenhydrAMINE may be administered IM or IV.
- Minor allergies have the potential to exacerbate chronic respiratory illnesses (e.g., asthma or COPD). Patients with a history of respiratory illness should be assessed for worsening of their condition and treated accordingly.
- Patients may have an existing treatment regime utilizing over-the-counter and/or prescribed antihistamines. Additional antihistamines should not be administered if the patient has taken antihistamines prior to paramedic or EMR/FR arrival due to the possibility of potentiation.

Referral Information

- While most cases of isolated urticaria are self-limiting and will resolve without treatment, patients with minor allergic reactions have potential to progress to life-threatening anaphylaxis.
- Anaphylaxis onset may be delayed for several hours after exposure to an allergen. Therefore, until referral pathways to alternate sub-acute pathways are developed, all patients with minor allergy symptoms should be conveyed to the emergency department for assessment.
- Eligible patients may be referred to Urgent and Primary Care Centres using the Minor Allergy assess, see, treat and refer clinical pathway.

General Information

- A minor allergic reaction is caused by an exaggerated immune response to an allergen that results in the degranulation of mast cells and basophils. Release of inflammatory mediators (primarily histamine) from cells in the dermal layer of cutaneous tissue may result in urticaria, erythema, and discomfort.
- Many minor allergic reactions are mediated by immunoglobulin E (IgE) in response to environmental allergens (e.g.,

insect stings, pollen), but acute urticaria may result from release of inflammatory mediators due to infection or spontaneous activation that is not IgE-mediated in approximately 50% of cases. Regardless of the underlying cause, treatment with antihistamines remains effective.

- Four types of histamine receptors (H1, H2, H3, and H4) are present in the body, with H1 and H2 receptors being the most relevant to minor allergic reactions. First-generation H1 antagonists (e.g., diphenhydrAMINE) cross the blood-brain barrier more readily and therefore are more likely to have sedative effects. Second-generation H1 antagonists (e.g., loratadine) are equally efficacious to first-generation H1 antagonists. Second-generation H1 antagonists are lipophobic and therefore less able to cross the blood-brain barrier, leading to reduced risk of sedative effects. Caution: first-generation H1 antagonists may cause a decreased level of consciousness with a potential to limit recognition of a progression to anaphylaxis.
- H2 antagonists (e.g., ranitidine) will not independently resolve urticaria but may potentiate the effect of H1 antagonists and should be considered for urticaria causing severe distress.
- H1 antagonists (e.g., diphenhydrAMINE) are not effective in resolving angioedema, cardiovascular, gastrointestinal, or respiratory symptoms in anaphylaxis, and therefore are considered a second-line therapy at best. ***First-line therapy in anaphylaxis remains the administration of epiNEPHrine.***

Interventions

First Responder

- Monitor patient for signs of deterioration into anaphylaxis
  - → E09: Anaphylaxis
- Remove allergen if practical (e.g., scrape off any stinger(s) / wash off topical allergens with soap and water)

Emergency Medical Responder – All FR interventions, plus:

- The patient's personal oral antihistamines may be taken according to manufacturer instructions
- The patient's prescribed inhalers may be taken as directed for known respiratory allergens if required

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Consider diphenhyDRAMINE to relieve integumentary symptoms and decrease histamine response

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Consider H2 antihistamine for additional relief of urticaria

Evidence Based Practice

Mild Allergic Reaction

Supportive

- Diphenhydramine

Neutral

Against

References

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Practice Updates

- 2022-02-03: Added Minor Allergy ASTaR information.

E11: Epistaxis

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Introduction

Approximately 60% of the population will experience at least one or more episodes of nosebleeding, or epistaxis, during their lifetime. Whilst the majority of episodes of epistaxis will be managed by the patient without seeking medical care, the knowledge of appropriate first aid measures to arrest nasal bleeding is low in the general population and so paramedics may be called to assist. Although epistaxis is normally without clear cause, or secondary to digital trauma, some may be related to more severe systemic disease and require careful follow-up by the patient's general practitioner.

Essentials

- The overwhelming majority of patients with epistaxis will respond well to simple first aid measures and these should be optimized before escalation to additional therapies.
- Approximately 95% of patients with epistaxis will have an anterior source of bleeding, if unable to promptly arrest epistaxis consider expeditious transfer for more invasive management in hospital for posterior epistaxis.
- A systematic assessment must be performed to evaluate whether epistaxis is secondary to a worsening of an underlying chronic condition.

Additional Treatment Information

- Appropriate initial first aid measures include:
  - Sitting the patient upright and leaning slightly forward to prevent blood running into the pharynx.
  - Compression of the nose bilaterally just distal to the bridge of the nose for **at least** 15 minutes.
  - A cool cloth or ice pack may be applied to the back of the neck, although the value of this is questionable and should not be prioritized.
- If inserted incorrectly, nasal packing may not address the source of the bleeding, mask ongoing hemorrhage, and may worsen re-bleeding on removal. Paramedics should not generally attempt to pack the nares of patients with epistaxis with gauze, and should convey patients requiring packing to hospital.
- The use of nebulized tranexamic acid remains controversial, and will be re-assessed following the publication of a number of ongoing randomized trials.

Referral Information

- In patients with minor epistaxis without significant risk factors, consider the use of the Epistaxis Assess, See, Treat, and Refer (ASTaR) Pathway.
- Patients who have ongoing bleeding, who are currently receiving oral anticoagulation or antiplatelet therapy, who have experienced recent head trauma, or who have an inherited coagulopathy are at high risk for serious bleeding and conveyance to an emergency department should be recommended.

General Information

- Examples of common antiplatelet and anticoagulation medications which may preclude paramedics from achieving suitable hemostasis include:
  - Warfarin (Coumadin)
  - Factor Xa Inhibitors: Rivaroxaban (Xarelto), Apixaban (Eliquis), Fondaparinux (Arixtra)
  - Anti-Platelet: Clopidogrel (Plavix), Aspirin (ASA), Prasugrel (Effient), Ticagrelor (Brilinta)
- Examples of coagulopathies which may pre-dispose the patient to significant bleeding include: o Hemophilia A and B
  - von Willebrand Disease

- Advanced liver disease (hepatitis, alcoholic hepatitis)

- Epistaxis may be a presentation of worsening underlying co-morbidities, conduct a thorough review of systems and physical exam to support decision-making around conveyance and to provide patient with sufficient information to make an informed decision should they refuse conveyance against advice.

Interventions

First Responder

- Position upright, leaning slightly forward to prevent blood running into the pharynx
- Apply direct pressure (manually or with nose clip) to the anterior aspect of the nose, just distal to the bridge of the nose for at least 15 minutes
- Consider a cool cloth or ice pack on the posterior neck as an adjunctive measure

Primary Care Paramedic – All FR and EMR interventions, plus:

- Normal saline to correct hypoperfusion and/or hypotension (systolic BP < 90 mmHg)
  - If no evidence of pulmonary edema, 500 mL bolus up to 2 liters -- reassess BP and lungs every 500 mL
  - Target BP of 90 mmHg systolic
- Consider use of ASTaR pathway for appropriate patients