

Which is which?

- A - Airway
- B - Breathing
- C - Circulation
- D - Disability
- E - Exposure

Use the ABCDE approach to assess if a patient requires fluid resuscitation. This is done by monitoring and assessing a patient’s respiratory rate, pulse, blood pressure, perfusion, lactate levels, and arterial pH levels closely. If any of these vital signs or values are out of range, fluid resuscitation should be considered. If a patient does not require fluid resuscitation and cannot meet their fluid/electrolyte needs orally or enterally, the patient will require routine maintenance IV fluids.

Typically, patients with signs of shock or severe dehydration such as tachycardia, increased capillary refill, sunken eyes, alteration in mental status, or dry mucous membranes will be admitted to the critical care floors for fluid resuscitation. Patients may require maintenance IV fluids if they have limited oral intake.

Summary of IV Fluid Dosing Guide	
Indication/Goal	Dosing
Fluid Maintenance <sup>1</sup>	25-30 mL/kg/day 1 mEq/kg/day of potassium, sodium, chloride 50-100 g/day of glucose Maximum: 3L of fluids/day
Fluid Maintenance (Adjusted) <sup>1</sup> Older age, renal impairment, malnourished, frail	20-25 mL/kg/day
Fluid Maintenance (Adjusted) <sup>1</sup> Obesity	Adjust dose based off ideal body weight
Fluid Replacement <sup>1</sup>	Add or subtract from routine maintenance dose
Fluid Resuscitation <sup>1</sup>	Identify cause of fluid deficit Fluid bolus of 500 mL IV fluids over 15 minutes
Fluid Resuscitation <sup>2</sup> Sepsis-induced hypoperfusion	30 mL/kg/day over 3 hours within diagnosis

References: 1. National Clinical Guideline Centre (UK). Intravenous Fluid Therapy: Intravenous Fluid Therapy in Adults in Hospital. London: Royal College of Physicians (UK); 2013 Dec. 2. Rhodes A, Evans LE, Alhazzani W, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. Intensive Care Med. 2017 Mar;43(3):304-377.



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Pharmacy Focus

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FORMULARY UPDATE

Intravenous acetaminophen (Ofirmev®) - expanded use

Intravenous acetaminophen restrictions have been removed. Prescribers can order intravenous acetaminophen for usual indications for any patient that is NPO. The order is valid for 24 hours. The order will be automatically discontinued if the patient is no longer NPO. Utilization will be presented to P&T for re-evaluation after 3 months.





**Question:** What is enoxaparin subcutaneous injection used for and what are the recommended administration sites?

**Response:** Enoxaparin is a **low molecular weight heparin**, which has antithrombotic properties. Our institution carries **enoxaparin injections in prefilled syringes with a needle attached for subcutaneous (SC or SQ) administration**. Enoxaparin is also commonly known by its brand name “Lovenox.®” Enoxaparin is **indicated** for patients who have:

- acute deep vein thrombosis (DVT) with or without pulmonary embolism (PE)
- prophylaxis of ischemic complications of unstable and non–Q-wave myocardial infarction
- prophylaxis of DVT in abdominal surgery, hip replacement surgery, knee replacement surgery
- medical patients with severely restricted mobility during acute illness
- treatment of acute ST-elevation myocardial infraction.<sup>1,2</sup>

Typically, SQ injections are administered in the arm, thighs, and abdomen.<sup>3</sup> Enoxaparin is typically administered SQ in the abdomen, however, patients who have had abdominal surgery may be unable to receive injections in the abdomen.

Administration **sites of enoxaparin injection depend on the manufacturer** of the product. There are two companies that make enoxaparin injection - Novaplus and Fresenius:

- **Novaplus enoxaparin:** SQ in **abdomen** only
- **Fresenius enoxaparin:** SQ in **any** appropriate SQ injection site<sup>1,2</sup>

Thus, **Fresenius enoxaparin is a better option for patients with abdominal surgery** who need VTE prophylaxis during their hospital stay and as an outpatient therapy. The Valley Hospital inpatient **pharmacy will carry only Fresenius enoxaparin** so that subcutaneous injection site is not an issue for any patient. Nursing can administer enoxaparin at any appropriate subcutaneous injection site.

**Reach out to your pharmacist if you have any questions!**

#### References:

1. Enoxaparin [Package insert]. Fresenius, Lake Zurich, IL. Fresenius Kabi: 2019.
2. Enoxaparin [Package insert]. Novaplus, Bridgewater, NJ. Sanofi-aventis 2009.
3. “How to Give Yourself a Subcutaneous Injection Using a Prefilled Syringe.” Memorial Sloan Kettering Cancer Center, [www.mskcc.org/cancer-care/patient-education/how-give-yourself-subcutaneous-injection-using-prefilled-syringe](http://www.mskcc.org/cancer-care/patient-education/how-give-yourself-subcutaneous-injection-using-prefilled-syringe). Accessed March 16, 2021.

## Managing hypokalemia

Jorge Nunez, FDU Pharm.D. Candidate 2022

Hypokalemia is defined as a **serum potassium (K+) concentration less than 3.5 mEq/L**. Normal potassium range is 3.5-5 mEq/L. In the absence of early detection and treatment, hypokalemia can cause serious complications that could be life-threatening.<sup>1</sup> Hypokalemia occurs in up to 21% of hospitalized patients and 2% to 3% of outpatients.<sup>2</sup>

Most hypokalemia cases are **due to**:

- drug-induced hypokalemia
- renal loss of potassium
- gastrointestinal loss of potassium
- hypomagnesemia
- inadequate dietary intake of potassium
- significant leukocytosis ( $>7.5 \times 10^9$  cells per L).

**Determining etiology** of the hypokalemia is necessary to appropriately manage patients, and careful monitoring during treatment is essential because supplemental potassium is a common cause of hyperkalemia in hospitalized patients.<sup>2</sup>

Hypokalemia **severity** is classified as mild, moderate, or severe:

**Mild: K<sup>+</sup> levels 3.0-3.5 mEq/L**

**Moderate: K<sup>+</sup> levels 2.5-3.0 mEq/L** - Symptoms: malaise, cramping, myalgia, weakness

**Severe: K<sup>+</sup> levels less than 2.5 mEq/L** - Symptoms: ECG changes, paralysis<sup>2</sup>

Potassium **supplementation is administered orally or intravenously depending on the severity**. The table<sup>1,2</sup> offers guidance on route of administration and when to recheck serum potassium levels.





	<i>Route of administration of potassium replacement</i>	<i>Dose</i>	<i>When to recheck serum potassium level</i>
<b>Mild or moderate hypokalemia: Serum K<sup>+</sup> greater than or equal to 2.5 mEq/L</b>	oral	10 to 20 mEq 2 to 4 times per day  max 40 mEq at a time	After <b>immediate release</b> oral replacement: <b>60 minutes after dose</b>  After <b>extended release</b> oral replacement: <b>3 hours after dose</b>
<b>Severe hypokalemia: Less than 2.5 mEq/L</b>  <b>or</b>  <b>Symptomatic hypokalemia</b>	IV	Available at TVH: 10 mEq KCl/100 mL 20 mEq KCl/100 mL Infuse via <b>peripheral line at 10 mEq/hour</b> (Use ECG monitoring if faster infusion is needed)  20 mEq KCl/50 mL via central line for post open heart patients	<b>30 minutes</b> after end of infusion

- References: 1. Veltri K, Mason C. Mediation-induced hypokalemia. *P&T*. 2015;40(3):1-5.  
2. Viera A, Wouk N. Potassium disorders: Hypokalemia & hyperkalemia. *American Family Physician*. 2015;92(6):487-95.

## Naloxone Product Comparison

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Naloxone is an **opioid antagonist** used as a reversal agent for opioids to counteract life-threatening depression of the central nervous and respiratory systems. Naloxone only works if a person has opioids in their system and naloxone has **no potential for abuse**. Naloxone **can be injected in muscle (IM), vein (IV), or under the skin (SQ), or sprayed into the nose (intranasal)**. All naloxone products should be **stored at room temperature** and away from light.<sup>1</sup> A summary of commonly available products is in the table.

<b>Naloxone Product Comparison</b>	<b>Narcan® Nasal Spray<sup>2,5</sup></b>	<b>Evzio® Auto Injector<sup>3,6</sup></b>	<b>**Generic nasal spray<sup>4</sup></b>	<b>*Injectable generic<sup>7</sup></b>
				
<b>Available without Rx?</b>	YES	NO	NO	NO
<b>Assembly required?</b>	NO	NO	YES	YES
<b>Strength</b>	4 mg/0.1 mL & 2mg/0.1 mL	2mg/0.4 mL	1mg/mL	0.4 mg/mL
<b>Dosing &amp; administration</b>	Spray 0.1 ml into one nostril. Repeat with second device into other nostril after 2-3 minutes if no or minimal response	Inject into outer thigh as directed. Place black side firmly on outer thigh and depress and hold for 5 seconds. Repeat with second device 2-3 minutes if no or minimal response	Spray 1 ml into each nostril. Repeat after 2-3 minutes if no or minimal response	Inject 1 mL in shoulder or thigh. Repeat after 2-3 minutes if no or minimal response.
<b>Route Dose Onset of action</b>	Intranasal 2mg or 4mg works in 2-5 min	IM or SQ 2mg works in 2-5 min	Intranasal 1mg/mL works in 2-5 min	IV or IM or SQ 0.4mg IV works in 1-2 min IM/SQ work in 2-5 min
<b>Can titrate dose?</b>	NO	NO	YES	YES
<b>Quantity</b>	Two-pack of two 4mg/0.1 mL intranasal device	Two-pack of 2mg/0.4 mL prefilled auto-injector device	2 mL Luer-Jet Luer Lock needleless syringe plus mucosal atomizer device	Single-use 1 mL vials or 10 mL multidose
<b>How Supplied</b>	Two-pack of single use intranasal devices	Two pack of single use auto-injector +1 trainer	Box of 10 Luer-Jet prefilled glass syringes	Box of 10 or package of 25 single-dose fliptop vials

References: 1. National Institute on Drug Abuse. Opioids. Available at: <http://drugabuse.gov>. Accessed on June 13, 2020. 2. Narcan Nasal Spray.[package insert]. Plymouth Meeting, PA. Accessed on June 7,2020. 3. Evzio. [package insert]. Richmond, VA. Accessed on June 7,2020. 4. Naloxone Hydrochloride. [package insert]. Accessed on June 7,2020. 5. Narcan. Lexi-Drugs. Wolters Kluwer Health, Inc. Hudson, Ohio. Available at: <http://online.lexi.com>. Accessed June 7,2020. . 6. Evzio. Lexi- Drugs. Wolters Kluwer Health, Inc. Hudson, Ohio. Available at: <http://online.lexi.com>. Accessed June 7,2020.. 7. Naloxone. Lexi-Drugs. Wolters Kluwer Health, Inc. Hudson, Ohio. Available at: <http://online.lexi.com>. Accessed June 7,2020.

\* In all TVH Pyxis machines

\*\* In ER Pyxis machines for police department to pick up



## Dosing IV fluids

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Intravenous fluids (IVF) are commonly used for fluid maintenance and to manage patients with **DEHYDRATION, HYPOVOLEMIA, HEMORRHAGE, or SEPSIS**.<sup>1,2</sup>

The indications incorporate **three main goals**, each with different recommended doses and infusion duration (Summary table on page 6):

- **fluid maintenance**
- **fluid replacement**
- **fluid resuscitation**

### Fluid maintenance

Patients who require **routine maintenance of IV fluids** should be limited to **25-30mL/kg/day** of IV fluids, 1mEq/kg/day of potassium, sodium, and chloride, and 50-100g/day of glucose. Patients who are **older, frail, have renal impairment, or are malnourished** may be prescribed less fluids at 20-25mL/kg/day. Patients who are **obese** should receive an **adjusted IV fluid rate** according to their ideal body weight. Patients **should not exceed 3 liters of fluids per day**.<sup>1</sup>

### Fluid replacement

Patients who require fluid replacement and redistribution due to **fluid or electrolyte deficits/losses** should be prescribed fluids by **adding or subtracting from routine maintenance doses**. Other sources of fluids and electrolytes should be considered into adjustments of the routine fluid therapies. Patients in the critical care unit are often prescribed various IV medications so all fluid sources should be taken into consideration when assessing dosing of maintenance fluids. These patients can be seen on both internal medicine and critical care floors.<sup>1</sup>

### Fluid resuscitation

If a patient requires fluid resuscitation, it is necessary to initiate treatment **by identifying the cause of the fluid deficit and treating the patient with a fluid bolus** of 500 mL of IV fluids over 15 minutes. If less than 2,000mL of fluids were given during resuscitation and the patient still needs additional fluid resuscitation, another fluid bolus of 250-500mL of IV fluids may be given.<sup>1</sup>

If the patient has **signs of sepsis-induced hypoperfusion**, 30mL/kg of IV fluids should be given within the first 3 hours of diagnosis. Following initial fluid resuscitation, additional fluids are to be given following constant and frequent assessment of hemodynamic status. Patients with hemorrhagic shock should be given fluid resuscitation with blood products over other fluids. Rate of fluid repletion for patients with hypovolemic shock should be individualized based off the patient's rate of fluid loss, cause of fluid loss, and any laboratory abnormalities. Typically, patients with hypovolemic fluid loss may be treated at an initial rate identical to the treatment option of septic shock (30mL/kg within the first 3 hours of treatment). Fluid resuscitation should be assessed through close monitoring of heart rate, blood pressure, mucous membrane, skin turgor, and overall well-being of the patient.<sup>1,2</sup>

Continued on page 6.....