

Hemodialysis: Anaphylaxis Treatment

Site Applicability

PHC Hemodialysis Units (SPH In-Centre and Community Dialysis Units)

Practice Level

RNs and LPNs who have additional education to provide nursing care in a PHC Renal Program Hemodialysis specialty unit

Profession	Administer medications to treat anaphylaxis following a provider order	Treatment of Anaphylaxis as a Nurse Independent Activity
RNs, LPNs	<ul style="list-style-type: none">Basic Skill	Advanced Skill (Requiring Additional Education) Upon successful completion of additional education, may: <ul style="list-style-type: none">Administer EPInephrine IM to treat anaphylaxisAdminister oxygen – see B-00-13-10019

Education for **Nurse Initiated Activity**:

- [Understanding Autonomous Practice and Nurse Independent Activities \(NIA\) or Nurse-Initiated Protocols \(NIP\)](#) on Learning Hub (Recommended for RN's, Required for LPNs)
- [Provincial Education Anaphylaxis – Initial Emergency Treatment by Nurses \(Adult and Pediatric\)](#) on Learning Hub (Required)

Requirements

- Nurse Independent Activities (NIAs) for RNs, RPNs, and LPNs is supported as per policy:
 - [Nurse Independent Activities \(NIA\) and Nurse Initiated Protocols \(NIP\) \(BCD-11-11-40001\)](#)
- Provider orders override the use of NIAs.

Need to Know

Anaphylaxis is defined as a severe allergic or hypersensitivity reaction to a foreign protein or other substance, affecting all ages and, in its most critical form, is characterized by life – threatening upper or

lower airway obstruction, bronchospasm, or from cardiovascular collapse. See [Appendix A](#) for signs and symptoms and [Appendix B](#) for World Allergy Organization Anaphylaxis criteria

- There will occasionally be patients who do not fulfill any of these criteria, but for whom the administration of epinephrine is appropriate. (e.g. single system reaction: patient has a known peanut allergy, history of anaphylactic reactions, accidentally consumes or comes in contact with the allergen, a sudden skin reaction occurs)
- The anaphylaxis diagnosis is based primarily upon clinical symptoms and signs, as well as a detailed description of the acute episode, including antecedent activities and events occurring within the preceding minutes to hours. The sooner the onset, the more rapid and severe the anaphylactic reaction. See [Appendix C](#) for more information
- Nurses at both SPH in-center and Community Dialysis Units should follow the decision support tool, scope of practice limits and conditions prior to administering epinephrine for the emergency management of anaphylaxis
- Nurses at in-center hemodialysis unit obtain required medication from automated dispensing cabinet (ADC) after selecting the **“Remove Kit – Hypersensitivity Reaction Kit”**
- Nurses at the community dialysis units obtain the necessary medication from the **“Emergency Black Box”**

Equipment and Supplies

- 1 – epinephrine 1:1000 (1 mg/mL) ampoule
- 1 - Blunt fill needle with filter
- 1 – 25 g needle
- 2 – 1 mL syringe
- Alcohol swab
- 1 – IV tubing
- 1 – IVAC pump
- Sharps container

Protocol

Assessment:

1. Assess the patient for signs and symptoms of anaphylaxis (See [Appendix A](#))
2. Assess patient’s vital signs.

Interventions:

(Refer to Conditional/Communication Orders in Cerner for Anaphylaxis or Suspected Hypersensitivity during Hemodialysis or Therapeutic Plasma Exchange Treatments)

If anaphylaxis suspected:

1. Remove exposure to the trigger if possible.
2. If reaction to medication suspected, stop medication (if IV medication, disconnect IV)

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- a. Stop dialysis
 - b. **DO NOT** return the patient's blood
 - c. Maintain patient access for further volume resuscitation with intravenous fluids, or
 - d. medication administration, when indicated
3. If reaction to dialyzer or related equipment:
 - a. Stop dialysis
 - b. **DO NOT** return the patient's blood
 - c. Maintain patient access for further volume resuscitation with intravenous fluids, or
 - d. medication administration, when indicated
4. If reaction to blood and/or blood products): (see [B-00-13-10068](#))
 - a. Stop blood and/or blood products
 - b. Stop plasma exchange
 - c. **DO NOT** return patient's blood
 - d. Maintain patient access for further volume resuscitation with intravenous fluids, or
 - e. medication administration, when indicated
 - f. Print Transfusion Reaction Form from FormFast and follow Transfusion Reaction Identification and management protocol

PROMPTLY AND SIMULTANEOUSLY:

- Assess Circulation - Airway - Breathing (C-A-B), skin, mental status
- LPNs Notify RN immediately
- For community dialysis units dial 911,
- Within SPH activate CODE BLUE button or dial **7111**
- Notify the Treating Provider **STAT**
- Observe for signs of life threatening anaphylaxis: upper airway obstruction, bronchospasm and hypotension
- If necessary, apply oxygen to maintain oxygen saturation greater than or equal to 92% (see [B-00-13-10019](#))
- Carry out other emergency or resuscitative measures as necessary **as per related SHOP policies and Decision Support Tools.**
- If contamination is suspected, send dialysate sample (pre-dialyzer) to the laboratory for microbiological analysis. Save set-up in biohazard bag for future analysis.

Documentation

1. Record event including signs, symptoms and interventions in the nursing narrative notes in Cerner
 - the cause of anaphylaxis (if known)

- Interventions
 - Patient response to treatment
 - Ongoing assessment data
 - Consultation with most responsible provider (MRP) or appropriate health care professional
2. Record initial vital signs (every 5 minutes to detect deterioration) and ongoing assessment data in iView –vital signs section and/or pre/intra/post-hemodialysis
 3. Perform a closed loop medication administration in Cerner to record emergency medications or other medications given
 4. Record in iView- Adult systems Assessment in Cerner under Respiratory section (if applicable)
 - Oxygen therapy, saturation and flow rate
 - Respiratory rate
 - Breath sounds
 5. Update Allergies Status on banner band in Cerner, if applicable.
 6. If anaphylaxis follows immunization, report adverse event following immunization and complete a Patient Safety Learning System (PSLS)

Patient and Family Education

- Patient should be advised to avoid exposure to allergen(s).
- Patient predisposed to anaphylaxis should wear some form of identification, such as a medical alert bracelet, naming the allergen(s).
- Patient should be advised of the signs and symptoms of anaphylaxis and to call 911 immediately.
- Patient may also be recommended to carry an EpiPen in some situations
- Patient receiving vaccinations should remain in the unit for 15 minutes following the injection for observation of any adverse effects; regardless of whether or not they have had that product before.

Related Documents

1. [B-00-13-10058](#) - Hemodialysis: Patient Assessment Pre, Intra and Post Dialysis
2. [B-00-12-10115](#) – Hemodialysis: Cardiac Arrest (Code Blue) Procedure in Community Dialysis Units
3. [B-00-07-10060](#) - Cardiac Arrest (Code Blue): Initiating, procedure (SPH – Only)
4. [B-00-13-10111](#) – Hemodialysis: Intradialytic Hypotension
5. [B-00-13-10068](#) – Blood/Blood Products: Transfusion Reaction Identification and Management
6. [B-00-12-40091](#) – Anaphylaxis: Initial Emergency Management (Adult and Pediatric)
7. [B-00-04-10001](#) – Nurse Independent Activities (NIA)/ Nurse Initiated Protocols (NIP) Approved at PHC
8. [B-0013-10019](#) – Oxygen Therapy, Acute Care

References

1. BC Centre for Disease Control. (2021). *Communicable Disease Control Manual Chapter 2: Immunization Part 5 – Adverse Events Following Immunization: Section V* – Retrieved April 5, 2023 from <http://www.bccdc.ca/>
2. BC Centre for Disease Control (2019). *Communicable Disease control Manual Chapter 2: Immunization Part 3- Management of Anaphylaxis in a Non-Hospital Setting*. Retrieved April 5, 2023 from <http://www.bccdc.ca/>
3. British Columbia College of Nurses and Midwives (2023). Licensed Practical Nurses Scope of Practice: Standards, Limits, and Conditions Retrieved on April 5, 2023 from <https://www.bccnm.ca>
4. Campbell, Ronna (2022). UpToDate: *Anaphylaxis: Emergency treatment*. Retrieved April 6, 2023 from <https://www.uptodate.com/>
5. Canadian Immunization Guide. (2021). Part 2 Vaccine Safety: Anaphylaxis and other Acute Reactions following Vaccination. Retrieved on April 6, 2023 from <http://www.phac-aspc.gc.ca>
6. Cardona, V., Ansotegui, I., Ebisawa, M., Thong, B., Turner, P., Worm, M., et al (2020). World Allergy Organization Anaphylaxis Guidance. DOI: <https://doi.org/10/j.wajou.2020.100472> Retrieved April 5, 2023 from <https://www.worldallergyorganizationjournal.org>
7. Anaphylaxis Emergency Action Plan, Adult. Elsevier Clinical Skills (2023). St. Louis, MO. Retrieved on April 5, 2023 from www.elsevierskills.com
8. Kemp, S.F. (2022). UpToDate: *Pathophysiology of Anaphylaxis*. Retrieved April 6, 2023 from <https://www.uptodate.com>

Appendices

- [Appendix A](#): Signs and Symptoms of Anaphylaxis
- [Appendix B](#): Anaphylaxis Criteria
- [Appendix C](#): Anaphylaxis Information
- [Appendix D](#): Anaphylaxis Mechanism and Triggers
- [Appendix E](#): Factors and Co-Factors that Contribute

Appendix A: Signs and Symptoms of Anaphylaxis

System	Signs and Symptoms
Skin, subcutaneous tissue, and mucosa (a, b, c)	<ul style="list-style-type: none"> • Diffused/local erythema (redness) • Pruritus (itchiness) • Urticaria (hives) • Angioedema (swelling underneath skin)
Respiratory (a)	<ul style="list-style-type: none"> • Cough • Wheezing • Shortness of breath (SOB) • Hoarseness/Stridor • Hypoxia
Gastrointestinal (a)	<ul style="list-style-type: none"> • Nausea/Vomiting/diarrhea
Cardiovascular (a)	<ul style="list-style-type: none"> • Rapid/weak/irregular pulse • Hypotension • Chest pain/tightness • Cardiac Arrest
Central Nervous system (a)	<ul style="list-style-type: none"> • Aura of impending doom, • uneasiness • throbbing headache (pre-epinephrine) • altered mental status • dizziness • confusion • tunnel vision

(a) Sudden onset of symptoms and signs is characteristic of anaphylaxis


(b) The purpose of listing signs and symptoms in this Table is to aid in prompt recognition of the onset of anaphylaxis and to indicate the possibility of rapid progression to multi-organ system involvement, not to grade severity. C Skin and mucosal symptoms are reported to occur in 80 to 90% of patients with anaphylaxis, respiratory tract involvement in up to 70%, gastrointestinal tract involvement in up to 45%, cardiovascular system involvement in up to 45%, and central nervous system involvement in up to 15%.

Appendix B: Anaphylaxis Criteria


Anaphylaxis is highly likely when any one of the following three criteria is fulfilled:

1 Sudden onset of an illness (minutes to several hours), with involvement of the skin, mucosal tissue, or both (e.g. generalized hives, itching or flushing, swollen lips-tongue-uvula)

AND AT LEAST ONE OF THE FOLLOWING:




Sudden respiratory symptoms and signs
(e.g. shortness of breath, wheeze, cough, stridor, hypoxemia)




Sudden reduced BP or symptoms of end-organ dysfunction (e.g. hypotonia [collapse], incontinence)


OR 2 Two or more of the following that occur suddenly after exposure to a *likely allergen or other trigger** for that patient (minutes to several hours):




Sudden skin or mucosal symptoms and signs
(e.g. generalized hives, itch-flush, swollen lips-tongue-uvula)



Sudden respiratory symptoms and signs
(e.g. shortness of breath, wheeze, cough, stridor, hypoxemia)




Sudden reduced BP or symptoms of end-organ dysfunction (e.g. hypotonia [collapse], incontinence)




Sudden gastrointestinal symptoms (e.g. crampy abdominal pain, vomiting)

OR 3 Reduced blood pressure (BP) after exposure to a *known allergen*** for that patient (minutes to several hours):



Infants and children: low systolic BP (age-specific) or greater than 30% decrease in systolic BP***



Adults: systolic BP of less than 90 mm Hg or greater than 30% decrease from that person's baseline

* For example, immunologic but IgE-independent, or non-immunologic (direct mast cell activation)

** For example, after an insect sting, reduced blood pressure might be the only manifestation of anaphylaxis; or, after allergen immunotherapy, generalized hives might be the only initial manifestation of anaphylaxis.

*** Low systolic blood pressure for children is defined as less than 70 mm Hg from 1 month to 1 year, less than (70 mm Hg + [2 x age]) from 1 to 10 years, and less than 90 mm Hg from 11 to 17 years. Normal heart rate ranges from 80-140 beats/minute at age 1-2 years; from 80-120 beats/minute at age 3 years; and from 70-115 beats/minute after age 3 years. In infants and children, respiratory compromise is more likely than hypotension or shock, and shock is more likely to be manifest initially by tachycardia than by hypotension.

Appendix C: Anaphylaxis Information

Considerations:

- Massive fluid shifts occur during anaphylaxis due to increased vascular permeability. Up to 35 percent of intravascular volume can shift to the extravascular space within 10 minutes during anaphylaxis
- Anaphylaxis may be difficult to recognize in certain clinical situations (i.e. Hemodialysis) when for other reasons patients may experience dramatic physiologic shifts with consequent changes in vital signs.
- Anaphylaxis can present without obvious skin signs & symptoms and without shock.
- Anaphylaxis is a much broader syndrome than “anaphylactic shock”
- 20 % of anaphylaxis episodes follow a biphasic reaction after a 2 to 9 hour asymptomatic period.
- Death from anaphylaxis usually results from asphyxiation due to upper or lower airway obstruction or from cardiovascular collapse.
- If time is lost early in the treatment of an acute anaphylactic episode, subsequent management can become more difficult.
- The patient’s posture during anaphylaxis may impact the clinical outcome.

Anaphylactic reactions can result from sensitivity to a variety of substances such as food and alcohol, insect bites (venoms), medications (e.g. antibiotics), latex, ethylene oxide, dialyzer membrane material, dialysis with contaminated water.

Anaphylaxis applies to all of the following:

- Acute systemic reactions involving IgE-dependent mechanisms
- Acute systemic reactions involving other immunologic mechanisms ([IgE independent] formerly called anaphylactoid reactions)
- Acute systemic reactions that occur independently of any immunologic mechanism due to direct release of histamine and other mediators from mast cells and basophils
- Acute systemic reactions without any obvious trigger or mechanism (idiopathic anaphylaxis)

See [Mechanism & Triggers](#) and [Factors & Co-factors](#) that contribute to general anaphylactic episodes; from the World Allergy Organization.

The acute management of anaphylaxis is the same, regardless of the trigger or mechanism involved.

1. Anaphylactic reactions can be prevented by:

- strict avoidance of potential allergens
- screening for allergens before a medication is prescribed or first administered
- proper rinsing of dialyzers prior to treatment to remove sterilants or other allergens
- use of dialyzers sterilized with electron beam, gamma-radiation or steam
- administration of antihistamines prior to treatment
- avoiding AN69 membranes in patients taking ACE inhibitors
- following Canadian Standards Association (CSA) standards for water treatment



2. **Goal of therapy** should be early recognition and treatment with epinephrine to prevent progression to life-threatening respiratory and/or cardiovascular symptoms and signs, including shock.
3. Action of epinephrine:
 - counteracts the histamine-induced vasodilation
 - increases heart rate and contractility to increase oxygenated blood flow to vital organs
 - reduces bronchospasm by its actions on smooth muscles of bronchial tree
 - suppresses body's immune response thereby slowing down the histamine cascade
4. **RNs** compound, dispense, and administer schedule II (i.e. epinephrine), and unscheduled medications without an order to treat a condition following client assessment and if they have completed additional education. See conditional/communication order in Cerner if/when suspected hypersensitivity/ Anaphylaxis
 - Conditions: diagnosed by registered nurses, include those things which (a) are resolved with nursing treatment; (b) require stabilization until the physician can diagnose and treat the underlying disease; and (c) result from a known disease or a treatment of that disease.
5. **LPNs** prepare and administer schedule II (i.e. Epinephrine) medications to treat anaphylaxis-if they have completed additional education.
6. There is no contraindication to EPInephrine administration in anaphylaxis.
7. If the patient develops anaphylaxis post vaccine administration, **do NOT** administer EPInephrine into the same muscle mass as the vaccine was administered.

Appendix D: Anaphylaxis Mechanism and Triggers


























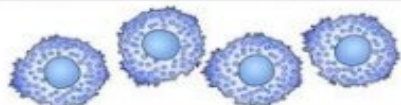
IMMUNOLOGIC MECHANISMS (IgE dependent)					
 peanut	 tree nuts	 shellfish	 fish	 stinging insects	 β -lactam antibiotics*
 milk	 egg	 soybean	 peach	 sesame	 NSAIDs* ** biologic agents*
Foods			Venoms		Medications*
 Natural rubber latex	 Occupational allergens		 Seminal fluid	 Aeroallergens	 Radiocontrast media*
IMMUNOLOGIC MECHANISMS (IgE independent)					
 Radiocontrast media*	 NSAIDs* **		 Fe^{+++} (e.g. HMW*** iron or other source)	 Biologic agents* (e.g. some monoclonal antibodies)	
NONIMMUNOLOGIC MECHANISMS (Direct mast cell activation)					
 Physical factors (e.g. exercise, cold, heat, sunlight)	 Ethanol		 Medications* (e.g. opioids)		
IDIOPATHIC ANAPHYLAXIS (No apparent trigger)					
 Previously unrecognized allergen?			 Mastocytosis/clonal mast cell disorder?		
*Trigger anaphylaxis by more than one mechanism **NSAIDs, non-steroidal anti-inflammatory drugs ***HMW, high molecular weight					

Image taken from World Allergy Organization anaphylaxis guidelines: summary (2011)

Appendix E: Factors and Co-Factors that Contribute

















AGE-RELATED FACTORS*				
				
Infants Cannot describe their symptoms	Adolescents and young adults Increased risk-taking behaviors	Labor and delivery Risk from medications (e.g. antibiotic to prevent neonatal group B strep infection)	Elderly Increased risk of fatality from medication or venom-triggered anaphylaxis	
CONCOMITANT DISEASES*				
				
Asthma and other respiratory diseases	Cardiovascular diseases	Mastocytosis/clonal mast cell disorders	Allergic rhinitis and eczema**	Psychiatric illness (e.g. depression)
CONCURRENT MEDICATIONS/ETHANOL/RECREATIONAL DRUG USE*				
				
β-adrenergic blockers and ACE inhibitors***		Ethanol/sedatives/hypnotics/antidepressants/recreational drugs (potentially affect recognition of anaphylaxis triggers and symptoms)		
CO-FACTORS THAT AMPLIFY ANAPHYLAXIS*				
				
Exercise	Acute infection (e.g. a cold or fever)	Emotional stress	Disruption of routine (e.g. travel)	Premenstrual status (females)
<p>* Age-related factors, concomitant diseases, and concurrent medications potentially contribute to severe or fatal anaphylaxis. Co-factors potentially amplify anaphylaxis. Multiple factors and co-factors likely contribute to some anaphylactic episodes.</p> <p>** Atopic diseases are a risk factor for anaphylaxis triggered by food, exercise, and latex, but not for anaphylaxis triggered by insect stings.</p> <p>*** ACE, angiotensin-converting enzyme</p>				

Image taken from world allergy Organization anaphylaxis guidelines: summary (2011)

Groups/Persons Consulted:

Renal Clinical Practice Group

Developed/Revised By:

Renal Clinical Nurse Educator

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