ALLERGIC/ANAPHYLACTIC REACTIONS

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INTRODUCTION

Only physicians trained in the technique and interpretation of epidural access and injection should perform this procedure. Allergic reactions and anaphylaxis, although infrequent, pose significant risks in interventional pain procedures due to their rapid onset and potential for severe, life-threatening outcomes. An allergic reaction is a hypersensitivity response by the immune system to a typically harmless substance, known as an allergen or antigen. This response is typically mediated by IgE antibodies, though other mechanisms exist. Allergic reactions present a spectrum of severity:

Mild to Moderate Reactions: These are often localized and primarily involve dermatologic symptoms such as urticaria (hives), pruritus (itching), and angioedema (localized swelling). They may also include mild respiratory or gastrointestinal complaints. For these milder reactions, prompt administration of an antihistamine is the cornerstone of treatment. Oral (PO), intravenous (IV), and intramuscular (IM) diphenhydramine block the effects of released histamine and are effective options for the acute management of mild-to-moderate reactions.

Anaphylaxis: Anaphylaxis is the most severe and life-threatening form of allergic reaction. It is an acute, systemic syndrome resulting from the sudden, widespread release of potent mediators (*e.g.*, histamine, tryptase, prostaglandins) from mast cells and basophils. The release of these mediators induces vasodilation, increased vascular permeability, and smooth muscle contraction, which leads to a rapid cascade of physiological derangements. Anaphylaxis is characterized by the involvement of two or more body systems (dermatologic, respiratory, cardiovascular, or gastrointestinal). Clinical manifestations include distributive shock, hypotension, tachycardia, bronchospasm, laryngeal edema, widespread urticaria, angioedema, flushing, abdominal pain, and vomiting [1].

Anaphylactoid vs. anaphylactic reactions: Historically, the term "anaphylactoid" was used for reactions with a similar clinical presentation that were not IgE-mediated (e.g., direct mast cell activation by certain drugs). However, since management is identical in the acute setting, the term “anaphylaxis” is widely used for both types of severe systemic reactions and will be used throughout the remainder of this protocol [2]. Regardless of the nomenclature, prompt recognition and immediate management, including airway protection, epinephrine administration, and aggressive fluid resuscitation, are required to prevent cardiovascular collapse and mortality in this situation.

CLINICAL MANIFESTATIONS OF ANAPHYLAXIS

Symptoms of anaphylaxis generally involve a rapid onset and progression across multiple organ systems [2]. The 2006 National Institute of Allergy and Infectious Disease (NIAID) describes 3 scenarios for anaphylaxis [3]: 1) sudden mucocutaneous signs with cardiovascular or respiratory compromise, 2) 2 or more organ systems involvement in an acute reaction (even if no cardiac or pulmonary involvement), or 3) reduced blood pressure after known exposure to allergen. Reduced BP or multi-organ system involvement can occur with or without cutaneous manifestations.

- Skin:
  - Urticaria (hives), pruritus (itching), flushing, angioedema (swelling of lips, face, throat, or tongue)
  - Cyanosis (may indicate severe respiratory or circulatory compromise)
- Respiratory:
  - Dyspnea, wheezing, stridor, hoarseness, dysphonia (change in voice), dysphagia (difficulty swallowing), cough
- Cardiovascular:
  - Hypotension – often initially associated with tachycardia, but can lead to bradycardia in severe cases
  - Dysrhythmias
  - Coronary artery spasm (potentially leading to myocardial infarction)
  - Distributive shock, leading to syncope
  - Cardiac arrest
- Gastrointestinal:
  - Abdominal pain, cramping, nausea, vomiting, diarrhea
- Genitourinary:
  - Urinary incontinence
- Neurological/General:
  - Headache
  - Anxiety, apprehension, feeling of impending doom
  - Dizziness, confusion

TYPICAL PRESENTATION

CASE #1: Woman with acute onset of anaphylaxis during contrast medium injection

A 53-year-old woman with no known drug allergies or prior contrast exposure was undergoing a left L5-S1 lumbar transforaminal epidural steroid injection with fluoroscopic guidance. Approximately 45 seconds after the administration of iodinated contrast medium, she began to complain of a sudden feeling of impending doom, generalized itching, and a "tightness in her chest." At the same time, the clinical team observed a rapidly developing urticarial rash on her torso and extremities, facial flushing, and periorbital edema. Her oxygen saturation dropped from 98% to 88%. The blood pressure, initially 132/80 mmHg, rapidly fell to 85/50 mmHg, and her heart rate increased from 70 to 115 beats per minute (bpm). The patient became increasingly anxious and appeared visibly distressed.

Analysis of case #1

- Leading Diagnosis: Anaphylaxis
  The **immediate onset** after contrast medium administration, combined with **multi-system involvement** (impending doom, itching, chest tightness, urticaria, flushing, edema, wheezing, desaturation, hypotension, tachycardia), is the classic presentation.

- Differentials Considered:
  - Vasovagal Reaction: Less likely given severe respiratory and dermatologic signs; typically lacks urticaria/angioedema; vasovagal reactions usually involve bradycardia.
  - Local Anesthetic Systemic Toxicity (LAST): Would present with neurological symptoms (e.g., perioral numbness, seizures) and cardiovascular instability, but typically without prominent rash or edema.
  - High Spinal/Epidural: Causes hypotension and respiratory depression, but not allergic signs like urticaria or angioedema. (NOTE: The typical 2-3 ml of 1% lidocaine used for local anesthesia would not typically cause LAST or a high spinal block.)
  - Acute Cardiac Event: Can cause chest tightness and hemodynamic instability, but generally does not include a widespread rash, angioedema, or wheezing.

CASE #2: Man with delayed anaphylactic reaction to antibiotics

A 49-year-old man, 15 minutes after receiving a prophylactic intravenous dose of cefazolin before a spinal cord stimulator trial, complained of a sudden onset of severe abdominal cramping and nausea, followed by a sensation of lightheadedness. He then reported that his throat was "closing up." Examination revealed diffuse erythema and urticaria over his entire body, and his voice became hoarse. His blood pressure was 90/60 mmHg (down from a baseline of 120/70 mmHg), and his heart rate was 105 bpm. Respiratory assessment revealed stridor, and he began to cough persistently, demonstrating significant respiratory distress despite maintaining oxygen saturation above 90% initially. The patient appeared pale and diaphoretic, and his level of consciousness was declining.

Analysis of case #2

- Leading Diagnosis: Anaphylaxis (Drug-Induced)
  The presentation at 15 minutes post-cefazolin, with **multi-system involvement** (abdominal cramping, nausea, lightheadedness, throat-closure sensation, diffuse urticaria, hoarseness, stridor, hypotension), is consistent with an allergic reaction.

- Differentials Considered:
  - Vasovagal Reaction: Unlikely given the prominent respiratory (stridor, hoarseness) and dermatologic features, vasovagal reactions typically involve bradycardia.
  - Septic Shock: Ruled out by the acute onset following drug administration and the presence of clear allergic manifestations.
  - Adverse Drug Reaction (Non-Anaphylactic): While some drug reactions can cause isolated symptoms, the rapid, severe, multi-organ progression in this case points to anaphylaxis.

In both scenarios, the **rapid progression** and **involvement of multiple organ systems** are critical clues that strongly support the diagnosis of anaphylaxis, demanding immediate intervention.

EMERGENCY PROTOCOL

Emergency management of anaphylaxis requires a swift, systematic approach. This protocol prioritizes immediate life-saving interventions. It is essential to stay current with the American Heart Association's Basic Life Support (BLS)/Advanced Cardiac Life Support (ACLS) protocols [4] and other evolving guidelines.

1. Call for help immediately.
    a. Initiate the facility's internal emergency code or protocol, or call emergency medical services (EMS) (911 or local equivalent).
    b. Direct a previously designated team member to bring the Automated External Defibrillator (AED) and crash cart/emergency kit to the room. In certain settings, if space allows, the equipment may be kept in the procedure room.
2. Remove Triggering Agent: Promptly discontinue any suspected causative agent (e.g., stop contrast medium infusion, remove latex gloves).
3. Position Patient
    a. Position the patient in a horizontal (supine) or slight Trendelenburg position.
    b. Position pregnant women in the left side recovery position.
    c. Position vomiting or unconscious patients in the recovery position (on their side).
    d. Position patients needing CPR supine.
4. Evaluate Airway, Breathing, and Circulation
    a. Start 100% O_2 via a non-rebreather mask, 10-15 L/min.
    b. Initiate BLS/ACLS protocols, if indicated. In anaphylaxis, airway obstruction is common, so be prepared to recognize obstruction, provide ventilation, and establish an advanced airway by inserting an endotracheal tube or laryngeal mask airway.
    c. Start an IV. In anaphylaxis, hypotension is common, so establish an IV early and be prepared to deliver IV medication and crystalloid boluses of 500-1000 ml.
5. Administer Medications
    a. Give epinephrine 0.3-0.5 mg IM without delay as critical first-line treatment [4].
        i. Note: Epinephrine auto-injectors (e.g., EpiPen) are convenient and can be administered rapidly through clothing. If using a vial, ensure the correct concentration (1:1000) is drawn and given IM.
        ii. *For hypotensive patients in shock*, IV epinephrine is the preferred route over IM, as reduced perfusion makes IM absorption unreliable and delayed. IV administration allows for faster onset and more readily titratable dosing. *For refractory hypotension unresponsive to IV epinephrine*, consider vasopressin (initial bolus of 1–2 units IV, increasing to 5 units as needed; if there is no significant hemodynamic improvement, the dose can be repeated or increased every 3 to 5 minutes) [5].
        iii. Repeat epinephrine IM dose every 5 to 15 minutes as needed, if symptoms persist or recur. Do not delay repeat doses.
    b. Immediately after epinephrine administration and while awaiting stabilization, administer second-line medications to help control symptoms and prevent further mediator release. These agents are not substitutes for epinephrine.
        i. Antihistamines: Administer H1 and H2 blockers to manage dermatologic symptoms (pruritus, urticaria) and improve hemodynamic stability.

    1. H1 Blocker: Diphenhydramine is a common choice [Adult Dose: 25–50 mg via IV (slow push) or IM].
    2. H2 Blocker: Ranitidine or famotidine (IV) is often given concurrently [Adult Dose: 20 mg (usually diluted in 5-10 ml of compatible IV fluid)].
6. Transfer to Higher Level of Care: All patients experiencing anaphylaxis should be transferred to an emergency department or intensive care unit for observation due to the risk of biphasic reactions (recurrence of symptoms hours after initial resolution).
7. Follow-up
    a. Notify the patient's emergency contact or family.
    b. Debrief team and review emergency protocols.

RISK MITIGATION/PREVENTION

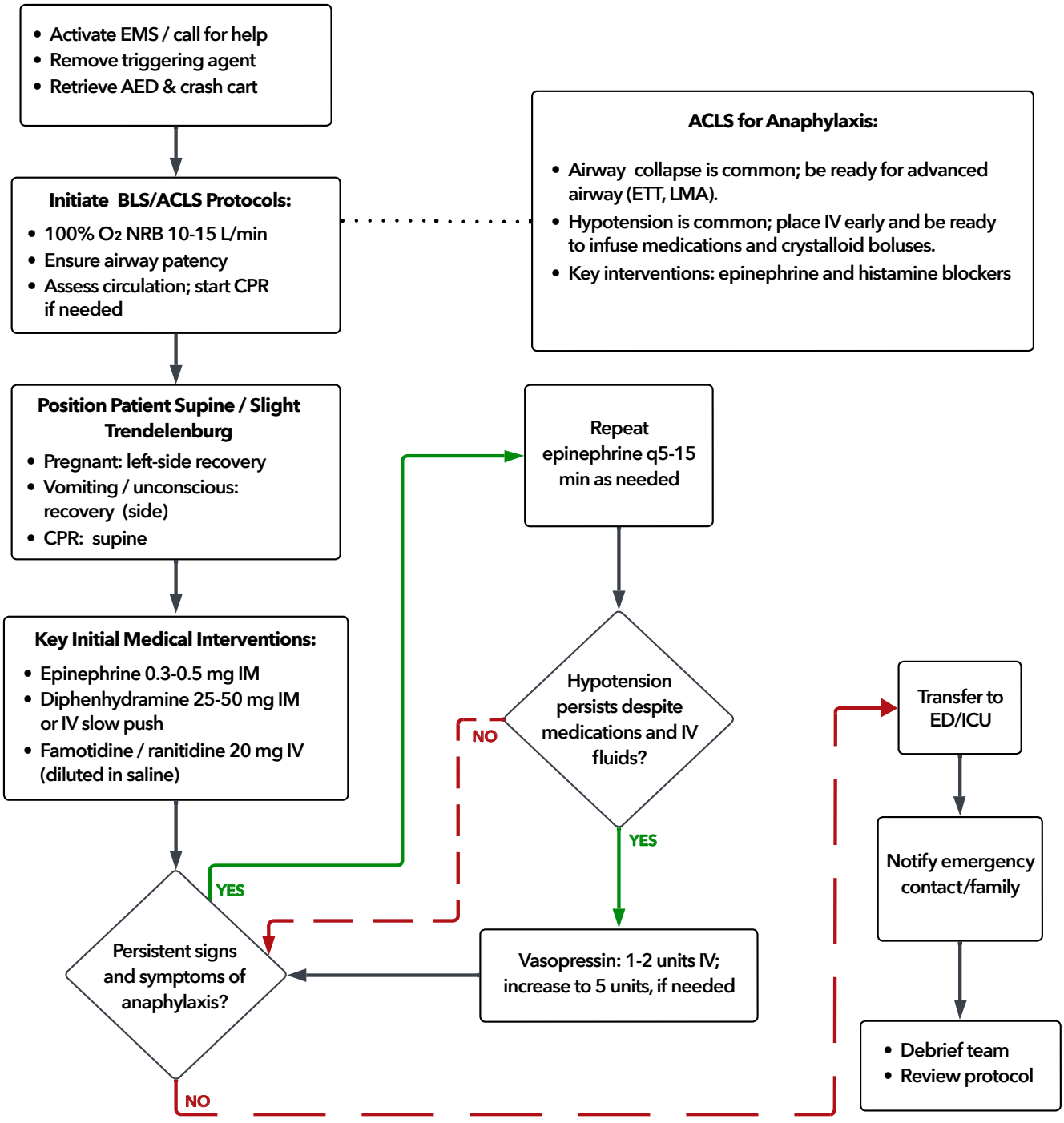
Minimizing the risk of allergic/anaphylactic reactions during interventional pain procedures requires a proactive, multi-pronged approach:

- Allergy History: Thoroughly document all prior adverse drug reactions, distinguishing true allergic reactions from side effects. Specifically inquire about reactions to contrast media, local anesthetics, antibiotics, and latex.
- Identification of High-Risk Patients: Recognize patients with a history of multiple allergies, severe atopy, asthma, or mast cell disorders, as they are at increased risk [6].
- Contrast Medium Management
    - o Avoidance: Whenever clinically feasible, avoid contrast media in patients with a history of severe reactions and consider utilizing alternative imaging (e.g., ultrasound) when appropriate [7].
    - o Premedication: For patients requiring contrast medium who have a history of allergic reactions, implement corticosteroid and H1-antihistamine premedication protocols. Using premedication protocols will not prevent anaphylaxis in all cases.
    - o Agent Selection: Use low-osmolar or iso-osmolar non-ionic contrast agents, which have a lower risk profile.
- Local Anesthetic Allergy Considerations: If a patient reports an allergy, differentiate between ester and amide types, if possible. True amide allergies are exceptionally rare. Preservatives may also act as allergens in some cases. Consider formal allergy testing if a true allergy is suspected.
- Antibiotic Stewardship: Ensure precise documentation of antibiotic allergies.
- Latex Allergy/Sensitivity: Use latex-free equipment for all patients with a history of latex allergy or sensitivity [8]. Consider routinely using latex-free equipment for all patients.
- Team Preparedness: Ensure all staff are trained to recognize and manage anaphylaxis, with emergency medications (especially epinephrine) and equipment immediately accessible.
- Patient Education: Inform patients about potential reactions and instruct them to report any unusual symptoms promptly.
- Regardless of the service site, the facility should be appropriately equipped to manage emergencies (see ***Advance Preparation for Emergencies***) [9]).

KEY CONSIDERATIONS/TAKEAWAYS

- Immediate recognition of multi-system involvement and timely epinephrine administration are the most crucial steps for managing life-threatening anaphylaxis. For milder allergic reactions, prompt administration of antihistamines remains the cornerstone of treatment.
- Comprehensive History and Risk Mitigation: Thoroughly assessing patient allergy history, identifying high-risk individuals, and implementing preventative strategies. Be aware of the antigenic properties of commonly used materials (*e.g.*, iodinated contrast media, antibiotics, local anesthetics, latex) during interventional spine procedures. When safe substitutes are available (e.g., nitrile gloves instead of latex gloves), physicians should consider using them.
- Systematic Emergency Protocol: Adhering to a clear, step-by-step emergency protocol — including calling for help, positioning the patient, administering epinephrine, securing the airway, providing oxygen, and supporting circulation—is critical for effective management.
- Post-Reaction Observation is Mandatory: All patients experiencing anaphylaxis require transfer to an emergency department or intensive care unit for observation due to the risk of biphasic reactions, even if initial symptoms resolve.
- Continuous Staff Training and Preparedness: Regular training for all staff on recognizing and managing anaphylaxis, along with a stocked, readily accessible emergency kit, ensures readiness.

SUSPECTED ANAPHYLAXIS



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DISCLAIMER

While these Emergency Protocols are intended to identify elements critical to the management of emergencies during interventional pain procedures, they are not intended to be inclusive of all proper emergency management protocols or exclusive of other methods of care reasonably utilized to obtain the same results. Nothing contained in these documents is intended to be used as a substitute for the care and knowledge of the individual clinician. They are guidelines based on evidence-informed expert consensus. IPSIS makes no representation and assumes no responsibility for the accuracy of the information contained or available through this website, and such information is subject to change without notice. Given the individual patient's clinical circumstances and preferences, the clinician's independent medical judgment should always determine patient care and treatment. Practitioners are advised to consider management options in the context of their training, background, and institutional capabilities when selecting recommended treatment options. IPSIS is not responsible, nor does it assume any legal liability or responsibility for the accuracy, completeness, clinical efficacy, or value of any such information or apparatus, product, or process described or referenced through this website or the information contained therein.