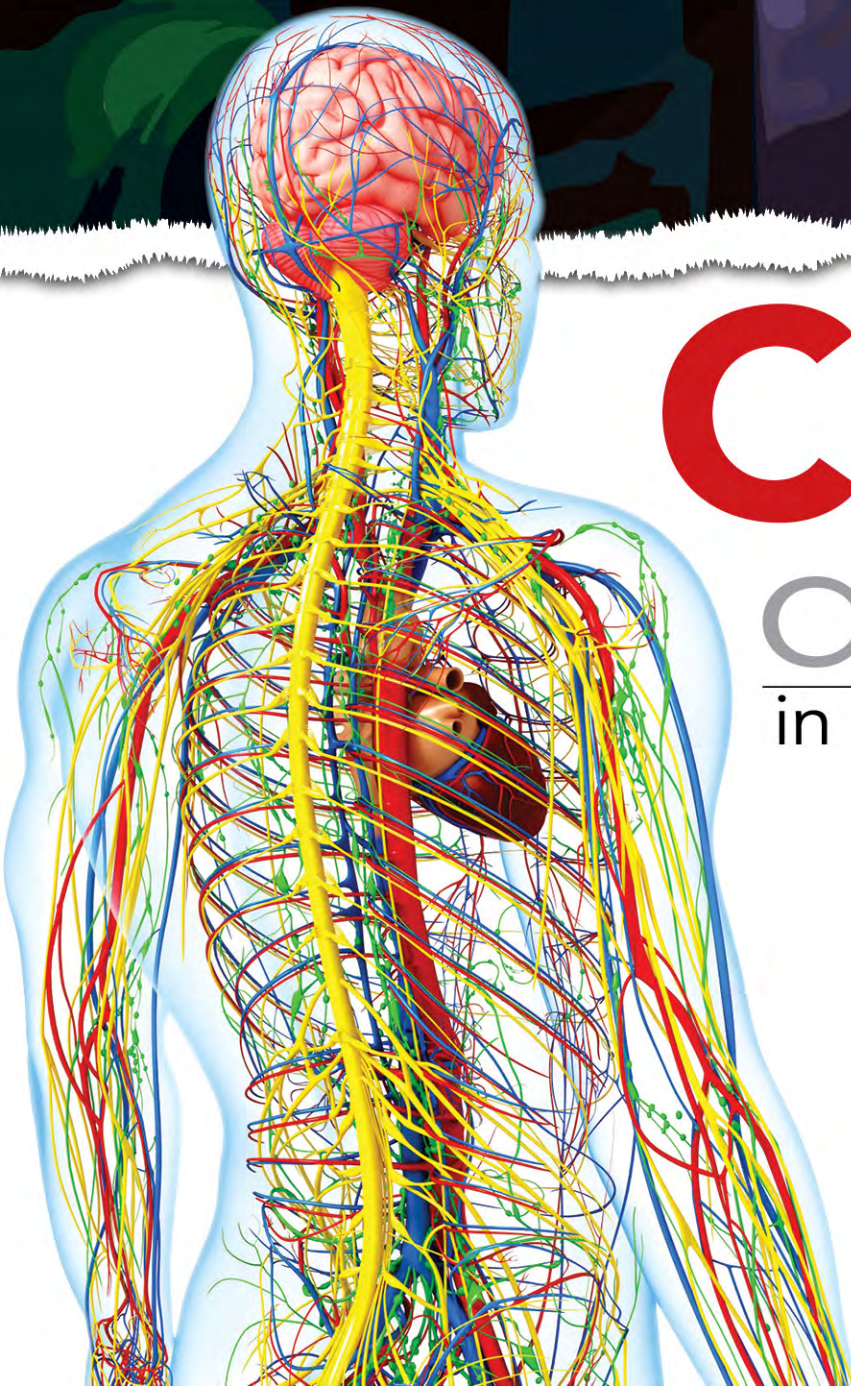


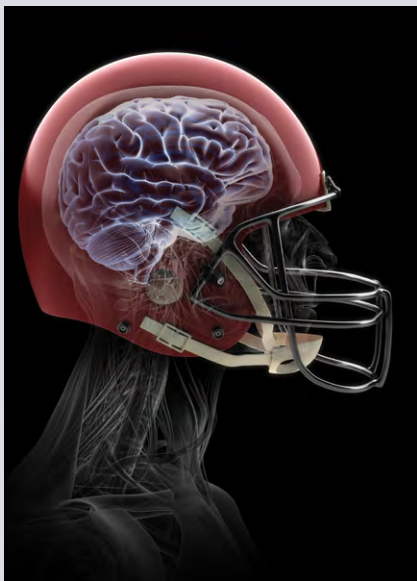
Critical Questions, Intelligent Answers



Critical decisions in emergency medicine



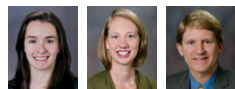
Residency Education
Program



Head Games

Traumatic Brain Injury – Concussion

LESSON 9



By Rachel R. Bengtzen, MD; Melissa A. Novak, DO; and James C. Chesnutt, MD

Dr. Bengtzen is an assistant professor in the Departments of Emergency Medicine, Family Medicine, and Sports Medicine, and an assistant program director of the Emergency Medicine Residency. Dr. Novak is an assistant professor in the Departments of Family Medicine and Sports Medicine; and Dr. Chesnutt is a clinical associate professor and the associate fellowship director of the Primary Care Sports Medicine Fellowship in the Departments of Orthopedics and Rehabilitation and Family Medicine at Oregon Health & Science University in Portland.

Reviewed by Daniel A. Handel, MD, MPH, FACEP

OBJECTIVES

On completion of this lesson, you should be able to:

1. Describe the physical examination findings that should raise concern for concussion.
2. Identify the most common complications of acute concussion and second impact syndrome.
3. Explain the options for treating concussion in the emergency department.
4. Explain the underlying pathophysiology of concussion.
5. Detail when and how patients can be cleared to resume physical activities following head injury.

FROM THE EM MODEL

18.0 Traumatic Disorders
18.1.6 Head Trauma

Defined by a complex constellation of physical, cognitive, and emotional symptoms, concussion is among the most common injuries seen in the emergency department. Although it falls on the mild end of the traumatic brain injury (TBI) continuum, this seemingly benign diagnosis can have life-altering — even deadly — consequences if not properly identified and managed.^{1,2}

CRITICAL DECISIONS

- What is a concussion, and what presentations should raise suspicion for this diagnosis?
- What role does the pathophysiology of concussion play in patient management?
- What diagnostic tools are most valuable for the evaluation of concussion?
- What are the best options for treating acute concussion in the emergency department?
- How should prolonged symptoms be managed?
- What critical information should be included in a concussive patient's discharge instructions, and how should return to play be approached?



CORE LESSONS

Case-based lessons on “EM Model” topics prepare students to manage even the most challenging patients.

Supercharge clinical education with key points compiled from *Critical Decision's* monthly core lessons. Our sample scripts enable instructors to shift teaching points based on the level of each learner. From basic instructional methods to modified just-in-time teaching (JITT), CDEM's practical, bedside content can be tailored to fill the needs of novice, mid-level, and advanced learners.

Teach Them a Lesson.

Critical Decisions is led and guided by a group of nationally renowned authors physician educators, including Drs. Michael Beeson, Amal Mattu, Joshua Broder. Their diverse backgrounds and experience infuse CDEM's content with notable emergency medicine expertise.

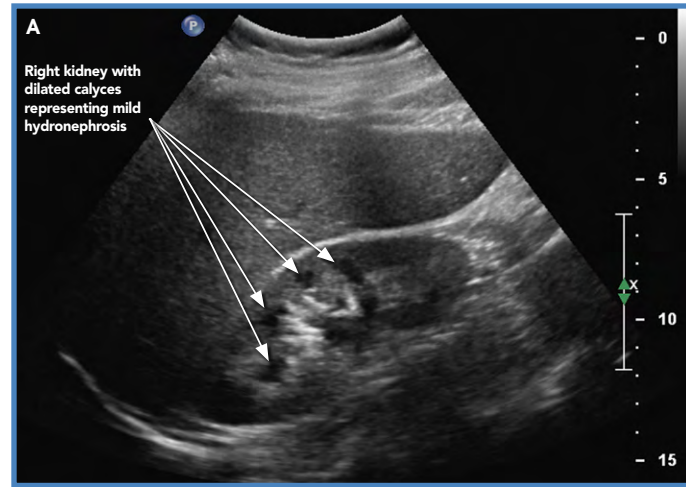
CDEM's wide range of essential topics adds variety to your clinical education plan and can help your program satisfy its individualized interactive instruction requirements. Based on imperatives outlined in the EM Model, each issue addresses the diagnosis and management of presentations common to the practice of emergency medicine.

Improve your institution's didactics with content that can easily be translated into small group discussions, institution-wide lectures, and case-based simulation exercises. Reinvigorate your clinical staff meetings and reduce your workload every month with two essential lessons and 20 CME questions — packaged and delivered straight to your inbox.

Enroll at acep.org/cdem or call 800-798-1822 to learn more!

CRITICAL IMAGE

Dr. Josh Broder's monthly feature leaves no case-based imaging question unanswered.



CASE

A 27-year-old woman with no past medical history presents with sudden and severe right lower quadrant abdominal pain and emesis.

POSTERIOR TIBIAL NERVE BLOCK

The Critical Procedure

A posterior tibial nerve block can make an otherwise difficult and uncomfortable procedure on the sole of a patient's foot relatively quick and painless. By providing anesthesia to the plantar surface, this approach obviates the need for local infiltration or a large volume of anesthetic.



By Steven J. Warrington, MD
Dr. Warrington is a core faculty member of the general surgery and emergency medicine residency programs, and the associate medical director for emergency department outreach and education at Kaweah Delta Medical Center in Visalia, California.



Transverse section of lower leg

CONTRAINDICATIONS

- Allergy to anesthetic/medication
- Overlying infected tissue
- Relative – An uncooperative patient
- Relative – Severe coagulopathy

Benefits and Risks

A successful posterior tibial nerve block eliminates the need for local anesthesia. Injections to the plantar surface of the foot can be painful and often must be repeated in larger procedures with topical anesthesia.

Nerve blocks of little additional risk local anesthesia; however, complications include permanent nerve injury or permanent nerve damage to the posterior tibial nerve. Other risks include the posterior tibial nerve.

In addition to a nerve block, patients educated about the associated with local



Ankle block involves anesthetizing five separate nerves: two deep, and three superficial. The two deep nerves are tibial and deep peroneal nerve. The superficial nerves are superficial peroneal, sural and saphenous.

PHOTO COURTESY OF SONOSIM, INC.

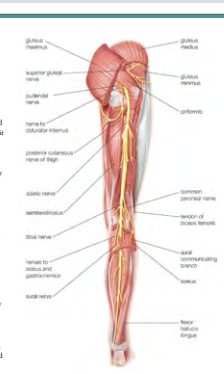


PROCEDURES

Step-by-step techniques and instructional images help students master the most essential bedside procedures.

TECHNIQUE

1. Obtain consent from the patient and notify the staff of the procedure.
2. Perform a thorough neurovascular examination of the ankle and foot.
3. Consider applying topical anesthetic to the site of expected needle insertion (ie, the area between the medial malleolus and Achilles tendon).
4. **If using ultrasound:**
 - a. Pinpoint the posterior tibial artery, which can aid in the identification of the nerve. The nerve will sit just posterior (toward the Achilles tendon) to the artery.
 - b. Clean the area, insert the needle just outside of the nerve on ultrasound, and inject approximately 5 mL of anesthetic. Consider injecting half of the medication deep to the nerve, and the remainder superficial to the nerve.
5. **If not using ultrasound:**
 - a. Identify the posterior tibial artery, just posterior to the medial malleolus. The insertion site will be approximately 0.5 to 1 cm superior/proximal.
 - b. Clean the area, insert the needle approximately 1 cm deep, and gently move it. If the patient feels paresthesia, withdraw slightly and inject up to 5 mL of anesthetic. If no paresthesia are felt, advance the needle until it reaches the posterior tibia. Withdraw slightly, and inject approximately 5 mL of anesthetic, while slowly withdrawing.
6. Allow the patient to sit for 10 minutes.
7. Determine if the patient can feel the onset of the anesthetic. It may take more time for the block to completely take effect; however, consider a second attempt or an alternate route of anesthesia if no effects are felt after 10 minutes.





- 1 Which of these features should raise suspicion for a life-threatening rash?
 - A. Any rash in a 6-month-old infant
 - B. Pruritic lesions
 - C. Rash that develops slowly over 6 months
 - D. Rash with associated oral lesions
- 2 Which characteristic differentiates erythema multiforme from Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN)?
 - A. Direct immunofluorescence showing IgG autoantibodies on keratinocytes
 - B. Lack of oral lesions
 - C. Negative Nikolsky sign
 - D. Skin involvement $\leq 10\%$
- 3 What is the most common cause of death in patients with SJS/TEN?
 - A. Hypovolemia
 - B. Pancreatitis
 - C. Respiratory failure
 - D. Sepsis

CME QUESTIONS

Challenge your students with relevant questions and insightful answer descriptions that test their mettle.



CME test results will be reported directly back to program administrators via ACEP's My Residency Learning Portal — a customized, single entry point for on-demand emergency medicine education.

CRITICAL ECG



Dr. Amal Mattu's popular feature makes sense of even the most challenging ECGs.




An 82-year-old man with severe weakness and diaphoresis.



LLSA REVIEW

We distill emergency medicine literature to deliver only the most essential information. Each monthly issue of CDEM provides a summary of one of the articles from ABEM's current reading list, with bullets highlighting the elements relevant to resident education.

**Tox Box**

ILLICIT OPIOID USE

By Bryan Corbett, MD, University of California Health Sciences, San Diego
Reviewed by Christian A. Tomaszewski, MD, MS, MBA, FACEP

Despite their value as an analgesic, opioids (particularly heroin [Di-acetylmorphine]) are being abused recreationally with alarming frequency. Unique complications stemming from specific compounds and routes of administration can be dangerously unpredictable. The increasing number of overdose deaths in recent years is partially attributable to the substitution of heroin with fentanyl and its analogs, which can be far more potent.

Complications

- Parenteral administration: Local cellulitis, abscesses (MRSA), bloodborne pathogens (HCV & HIV), endocarditis, sepsis, and botulism (black tar heroin)
- Opioid tablets (crushed and diluted in water to be injected intravenously): Binding and filler ingredients (eg, talc, starch, and microcrystalline cellulose) can cause a pulmonary granulomatous reaction, progressing to pulmonary fibrosis and hypertension; extra-pulmonary deposition in the heart, liver, and spleen (undetermined clinical significance)
- "Free basing" (smoking heroin off of aluminum foil): Associated with spongiform encephalopathy (bradykinesia, ataxia, and speech abnormalities)

Toxic Dose

Toxicity threshold unspecified. Although the risks increase with higher doses, outcomes depend on individual factors (eg, genetics and tolerance).

Clinical Evaluation

Diagnosis of acute opioid intoxication is a clinical toxidrome, including respiratory depression (decreased tidal volume, then rate), CNS depression, miosis (not seen with meperidine and some agonist-antagonist opioids), hypotension (severe cases), and evidence or a history of drug abuse.



DRUG and TOX BOX

Indications, precautions, and dosing are made simple in our monthly EM-focused Drug and Tox Box features.