



Product Preview

Volume III

Emergency Trauma Care: Current Topics and Controversies

Edited by
Eric Legome, MD, FACEP
Lee W. Shockley, MD, MBA

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18 Trauma CME Credits • 18 ANCC Contact Hours

Emergency Trauma Care: Current Topics and Controversies, Volume III

Editors

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New Features in Volume III: To support your learning and provide tools to improve your practice, we have included a number of new features in this volume, including:

Instructional Videos

Utilizing Ultrasound in Trauma

- Dr. Turandot Saul, Associate Professor of Emergency Medicine at Icahn School of Medicine at Mount Sinai and Ultrasound Division Director at Mount Sinai St. Luke's and Mount Sinai West
- 40 minutes
- Filmed using a live subject, this video will help you build critical skills for better ultrasound reads.
- This expert-guided video provides tips and techniques for assessing penetrating trauma injuries; using E-FAST to evaluate hemothorax, pneumothorax, pericardial fluid, and peritoneal free fluid; evaluating splenorenal injuries; using the optic nerve sheath diameter to assess intracranial pressure; and examining for long-bone fractures.



Can't-Miss Orthopedic Injuries

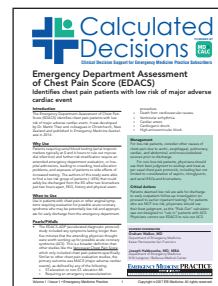
- Dr. Melissa Leber, Assistant Professor of Emergency Medicine and Orthopedics at Icahn School of Medicine at Mount Sinai and Director of Emergency Department Sports Medicine at Mount Sinai Hospital
- 45 minutes
- Case-based video presentation on easy-to-miss fractures
- Close-up views of a variety of musculoskeletal injuries, including Maisonneuve fracture, Achilles tendon rupture, Lisfranc injury, shoulder pain, boutonniere deformity, volar plate rupture, knee osteoarthritis, and tibial plateau fracture



Look for this video icon throughout chapters 2 and 4.

Calculated Decisions/MDCalc

- **Calculated Decisions**, published in collaboration with our partner, **MDCalc**, not only provides links to relevant calculators, but also the who, what, and why behind the medical calculators you use every day. MDCalc's formulas, algorithms, rules, and scores help you make evidence-based decisions when caring for your patients.
- The *Calculated Decisions* issues included in this book provide expanded reviews of key medical calculators related to the topics covered, including:
 - Wound Closure Classification
 - Focused Assessment with Sonography for Trauma (FAST)
 - TASH (Trauma-Associated Severe Hemorrhage) Score
 - Blast Lung Injury Severity Score
 - Bastion Classification of Lower Limb Blast Injuries
 - Glasgow Coma Scale Score
 - Parkland Formula for Burns
 - Ottawa Knee Rule
 - Ottawa Ankle Rule



Look for this **MDCalc** logo throughout the chapters.

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Emergency Trauma Care: Current Topics and Controversies, Volume III

Product Preview Information

The information contained herein is a representative sample of the complete product, and is intended to provide a sense of the quality and comprehensive nature of the product.

This 5-chapter resource, published in March 2018, reviews aspects of emergency trauma care that you may be called upon to manage any day: wound care, utilizing ultrasound in trauma, blast injuries and mass-casualty trauma, fracture care, and nonopioid pain management. In addition to our distinguished authors' discussions, we have included pertinent commentaries from the emergency medical services, nursing, surgical, and charting perspectives, in an effort to give a view of all aspects of trauma care.

Included In This Volume:

1. 110 pages of evidence-based content, covering 5 critical topics
2. 18 AMA PRA Category 1 Credits™. Included as part of the 18 credits, this CME activity is eligible for 18 trauma credits, 4.5 Pharmacology credits, and 3.5 Pain Management credits, subject to your state and institutional approval.
3. 18 ANCC credits, plus 4.6 Pharmacotherapy credits
4. 2 skills-based videos on ultrasound and fracture care
5. 9 supplemental issues of *Calculated Decisions*
6. Summarized information to help you keep up with current guidelines and best practices
7. Treatment recommendations to help you determine the critical actions required when caring for these patients
8. And much more!

The 5 topics covered in this volume address some of the most pressing concerns for emergency clinicians:

1. Wound Care
2. Ultrasound in Trauma
3. Blast Injuries and Mass-Casualty Events
4. Fracture Care
5. Non-Opioid Analgesia

This product is available in print and online. Each order includes access to the PDF version of the book, as well as to the supplemental videos and the issues of *Calculated Decisions*.

Emergency Trauma Care: Current Topics and Controversies, Volume III CME Accreditation Information

18 Trauma
CME credits
included

This CME activity is sponsored by EB Medicine
Release Date: March 1, 2018
Date of Most Recent Review: February 1, 2018
Termination Date: March 1, 2021
Time To Complete Activity: 18 hours

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education.

Accreditation Statement: EB Medicine is accredited by the ACCME to provide continuing medical education for physicians.

Credit Designation Statement: EB Medicine designates this enduring material for a maximum of 18 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Specialty CME: Included as part of the 18 credits, this CME activity is eligible for 18 trauma credits, 4.5 Pharmacology credits, and 3.5 Pain Management credits, subject to your state and institutional approval.

Needs Assessment: The need for this educational activity was determined by a survey of medical staff; review of morbidity and mortality data from the CDC, AHA, and NCHS; evaluation of prior activities for emergency medicine clinicians, physician surveys, meetings with board-certified physicians, and attendance at annual conferences.

Goals: The goal of this activity is to increase clinician competency in various trauma settings, including wound care, utilizing ultrasound in trauma, blast injuries and mass-casualty trauma, fracture care, and nonopioid pain management.

Learning Objectives: At the conclusion of this CME activity, you should be able to:

1. Discuss the principles of traumatic wound care and utilize advanced wound closure techniques in the emergency department.
2. Utilize ultrasound to assess for intra-abdominal and intrathoracic injuries and free fluid with E-FAST, to identify potential increased intracranial pressure using the optic nerve sheath diameter, and to identify long-bone fractures.
3. Describe the approach to management of blast injuries and mass-casualty events.
4. Identify frequently missed orthopedic injuries and manage various types of traumatic fractures.
5. Apply methods of nonopioid pharmacological pain management in trauma care.

Target Audience: This enduring material is designed for emergency medicine physicians, physician assistants, nurse practitioners, and residents.

Course Director: Andy Jagoda, MD, FACEP, Professor and Chair Emeritus, Department of Emergency Medicine; Director, Center for Emergency Medicine Education and Research, Icahn School of Medicine at Mount Sinai, New York, NY

Disclosure Information: It is the policy of EB Medicine to ensure objectivity, balance, independence, transparency, and scientific rigor in all CME-sponsored educational activities. All faculty participating in the planning or implementation of a sponsored activity are expected to disclose to the audience any relevant financial relationships and to assist in resolving any conflict of interest that may arise from the relationship. In compliance with all ACCME Essentials, Standards, and Guidelines, all faculty for this CME activity were asked to complete a full disclosure statement. The information received is as follows: **Dr. Baranchuk, Dr. Baron, Dr. Bedolla, Dr. Berry, Dr. Davenport, Dr. Goldstein, Dr. Haering, Dr. Hilton, Dr. Klein, Dr. LaPietra, Dr. Lavine, Mrs. Leas, Dr. Leber, Dr. Legome, Dr. Motov, Dr. Pendery, Dr. Rabrich, Dr. Rose, Dr. Schechter, Dr. Shockley, Dr. Tansek, and their related parties report no significant financial interest or other relationship with the manufacturer(s) of any commercial product(s) discussed in this educational presentation. Dr. Jagoda made the following disclosures: Consulting fees, Banyan Biomarkers; Consultant role, Daiichi Sankyo, Johnson & Johnson, Astra Zeneca, and Pfizer.**

Commercial Support: This activity received no commercial support.

Method of Participation: Read the printed material and complete the CME Answer And Evaluation Form on page 113 or online at www.ebmedicine.net/EMTraumaCareVol3.

You may also scan the QR code below with an enabled device to take the CME test. Note that the entire test does not have to be completed at one time; you may stop at any point and the questions correctly answered will be saved, but the CME credit certificate will not be issued until all questions have been answered.



Hardware/Software Requirements: You will need a PC or Macintosh to access the PDF online and complete the online CME test.

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Emergency Trauma Care: Current Topics and Controversies, Volume III

CNE Accreditation Information

In support of improving patient care, this activity has been planned and implemented by the Postgraduate Institute for Medicine and EB Medicine. Postgraduate Institute for Medicine is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE), and the American Nurses Credentialing Center (ANCC), to provide continuing education for the healthcare team.

Traumatic Wound Care Management

The maximum number of hours awarded for this Continuing Nursing Education activity is 4 contact hours.
Designated for 1.3 contact hours of pharmacotherapy credit for Advanced Practice Registered Nurses.

Utilizing Ultrasound in Trauma

The maximum number of hours awarded for this Continuing Nursing Education activity is 2.5 contact hours.

Blast Injuries and Mass-Casualty Trauma

The maximum number of hours awarded for this Continuing Nursing Education activity is 2.5 contact hours.

Fracture Care in Trauma

The maximum number of hours awarded for this Continuing Nursing Education activity is 3.5 contact hours.

Nonopioid Analgesic Modalities for Management of Acute Traumatic Pain

The maximum number of hours awarded for this Continuing Nursing Education activity is 3.5 contact hours.
Designated for 3.3 contact hours of pharmacotherapy credit for Advanced Practice Registered Nurses.

Utilizing Ultrasound in Trauma Video

The maximum number of hours awarded for this Continuing Nursing Education activity is 1 contact hour.

Orthopedic Injuries Video

The maximum number of hours awarded for this Continuing Nursing Education activity is 1 contact hour.

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**18 CNE
credits included
4.6 Pharmacotherapy
credits
included**



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Traumatic Wound Care Management

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Introduction

The United States Centers for Disease Control and Prevention (CDC) estimated that 7 million open wounds were treated in the United States in 2007.¹ In 2011, there were more than 6 million emergency department (ED) visits for open wounds.² Nonetheless, there is a limited body of literature to guide the emergency clinician in caring for wounds and a paucity of high-quality randomized controlled trials studying clinical outcomes from the ED. Much of standard practice is based on studies as old as 120 years, animal models, and in vitro studies. However, some topics have been studied extensively in the past 2 decades, including topical adhesives, absorbable sutures, irrigation, and time to wound closure.

Isolated soft-tissue wounds are rarely life-threatening, but the goals of care are to optimize pain control, hemostasis, cosmesis, prevention of infection, and rapid wound healing. Emergency clinicians should be facile and comfortable with the basics of complex wound repair.

Epidemiology and Pathophysiology

Epidemiology

Wound infection rates vary widely, ranging from 1% to 30%;³ however, the majority of studies quote an average infection rate of 2% to 6%.^{4,5} The vast majority of acute lacerations are accidental. A minority of traumatic wounds are caused by nonaccidental trauma, assault, or self-infliction. Nonaccidental trauma should be considered based on clinical suspicion, if not obvious or stated. This is important to consider, especially in children and the elderly, as they may require further psychosocial evaluation, toxicological considerations, and examination for other injuries.⁵

Anatomy

The skin provides a dynamic barrier with thermoregulatory, sensory, metabolic, and immune functions. Disruptions may cause infection, fluid loss, and scarring, depending on the characteristics of the patient and injury. The skin is comprised of 3 layers:

the epidermis, the dermis, and the subcutaneous layer (hypodermis), each ranging in thickness from 0.01 to 1.5 mm. The epidermis is avascular and keratinized. The dermis contains most of the neurovascular, exocrine, and structural elements of the skin. The subcutaneous layer contains fat and vascular tissue.⁶

Pathophysiology and Classification

Wounds can be classified and risk stratified according to contamination, location, size, time since injury, and mechanism of injury. The most common classification used for traumatic wounds comes from the surgical literature and the CDC, although it is not as relevant to the ED. Wounds can be classified as *clean*, *clean-contaminated*, *contaminated*, and *dirty*.⁷ Clean and clean-contaminated wounds can be achieved only in the operating room, where bodily flora or active infections may contaminate a maximally sterile field. All wounds in the ED should be considered, at best, to be contaminated. In 2016, the European Academy of Emergency Medicine and Care (AcEMC) and the World Society of Emergency Surgery (WSES) suggested an alternative classification system that may be more relevant to the ED. In this system, wounds are classified as *traumatic*, *dirty-traumatic*, and *infected-traumatic*. This simple classification defines “dirty” as macroscopic material, animal bites, devitalized tissue, or delayed treatment.⁸

Emergency Department Evaluation

Initial Evaluation

The initial evaluation should focus on stabilization of significant and dangerous injuries. Hemostasis should be obtained for any significant bleeding. Soft-tissue wounds can be assessed during the secondary survey. An often-underappreciated aspect of the initial evaluation is pain control,⁹ which should be addressed as early as possible. Additionally, risk factors for wound infection should be considered (see Table 1, page 14), and tetanus prophylaxis should be provided, if needed, based on the type of wound. (See Table 2, page 14.)

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Calculated Decisions Issue

- Focused Assessment With Sonography for Trauma (FAST)

Bonus Video

- Utilizing Ultrasound in Trauma (40 minutes)

Utilizing Ultrasound in Trauma

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Bonus Video: Utilizing Ultrasound in Trauma

In this 40-minute video presentation, Dr. Turandot Saul demonstrates the ultrasound techniques discussed in this chapter on a live patient. Go to the link or scan the QR code to access the video from a smartphone or tablet.

www.ebmedicine.net/Trauma3Ultrasound



Introduction

Point-of-care ultrasound (POCUS) plays an integral role in caring for trauma patients. Since the introduction of the focused assessment with sonography for trauma (FAST) examination, the number of applications for ultrasound in the care of the trauma patient has expanded greatly. Its ability to evaluate and re-evaluate trauma patients at the bedside allows for the rapid identification of pathology, which can expedite aggressive resuscitation and necessary interventions.

As the number of applications of POCUS in the trauma patient has expanded, so have controversies related to how it should be used in different clinical scenarios. Understanding the strengths and limitations of POCUS in the trauma setting will support the emergency clinician's ability to provide optimal care for patients.

The Role of the FAST Examination in Thoracoabdominal Trauma

The use of ultrasound in the evaluation of blunt thoracoabdominal trauma is well described in the literature. Unlike computed tomography (CT) or diagnostic peritoneal lavage, the FAST examination is rapid, inexpensive, reproducible, and noninvasive, and it does not expose the patient to ionizing radiation.¹ Evidence for the utility of ultrasound in the evaluation of penetrating cardiothoracic and abdominal trauma, however, is more limited and varied. Current research demonstrates that ultrasound is an excellent screening tool for penetrating thoracic and cardiac injuries, with a high sensitivity for detecting injuries requiring acute intervention. For abdominal injuries, however, the sensitivity for injury detection is low, and thus the utility of ultrasound as a screening tool is limited.

Blunt Thoracoabdominal Trauma

Ultrasound for the evaluation of blunt thoracoabdominal trauma was first described in the early 1970s.² Since then, the role of ultrasound in blunt trauma has been well studied, and strong evidence exists for the FAST examination to be considered the initial diagnostic modality to exclude hemoperitoneum in trauma patients.³⁻⁷ Additionally, multiple studies have evaluated the test characteristics of ultrasound for the detection of pneumothorax in blunt thoracic trauma, with sensitivity ranging from 92% to 100% and specificity ranging from 94% to 99%, when compared to chest radiograph or CT.⁸⁻¹⁰ Serial ultrasound examinations may be used over time or if the patient's clinical situation changes.

Pericardial Injury

Ultrasound is very sensitive for the detection of fluid in the pericardial space. With high-quality images and correct interpretation, as little as 20 mL of fluid can be visualized.¹¹ In the first prospective study on this topic in 1990, 73 patients with penetrating thoracic trauma and stable vital signs received an ultrasound followed by a subxiphoid pericardial window in the

Blast Injuries and Mass-Casualty Trauma

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Calculated Decisions Issues

- TASH (Trauma-Associated Severe Hemorrhage) Score
- Blast Lung Injury Severity Score
- Bastion Classification of Lower Limb Blast Injuries
- Glasgow Coma Scale
- Parkland Formula for Burns

Blast Injuries and Mass-Casualty Trauma

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Epidemiology

With the exception of the September 11th, 2001 terrorist attacks in New York and the 1995 Alfred P. Murrah Federal Building bombing in Oklahoma City, very few explosion or bombing incidents have caused mass fatalities in the United States. Besides these isolated events, there are fewer than 50 deaths, annually, from blast events in the United States.¹ Nonetheless, injuries from blast events are not rare. Between 1983 and 2002, there were nearly 10 times more injuries than deaths from blast events in the United States.²

Over a 20-year period in the United States, there were 36,110 bombings, of which 21,327 were explosive bombings, 6185 were incendiary bombings, 1107 were premature bombings, and 7581 were planned but unsuccessful bombings. Most of these events occurred in private residences, accounting for 29% of bombings, 31% of injuries, and 55% of deaths. Government facilities were the locations for 4.4% of incidents, 12.7% of injuries, and 25.5% of deaths.² Most of these were intentional, and not accidental blast events. Intentional bombings have numbered more than 1200 annually in the United States since 1991.³ Of particular concern are terrorist bomb events, which have been increasing worldwide between 1999 and 2006.⁴

The Physics of Blast Events

Blast events are caused by explosive devices. A blast is an instantaneous transformation of solid or liquid matter to gas, which releases energy in the form of light, sound, heat, and pressure. The energy release causes chemical bonds to break down, generating a pressure wave that expands in the explosive device until it reaches the air interface. This initiates a blast wave in the surrounding air that compresses the air around the explosive device, which then expands rapidly and spreads through the atmosphere.^{3,5} The blast wave can travel up to 17,895 mph, with pressures up to 30,000 atm.³ The blast wave is characterized by a rapid peak, followed by a temporary vacuum, called *underpressure*, due to the inertial effect in air. This idealized model wave is also known as a *Friedlander wave*. (See Figure 1.) As the wave spreads

away from the explosive device, its magnitude falls inversely to the third power of the radius.⁵ The leading edge of a blast wave is called a *blast front*.⁶

The blast wave is followed by blast wind, a superheated, powerful, and fast-moving wind. Damage from blast wind is proportional to the distance from the explosive device.^{1,3,7} The effects of blast wind predominates over those of the blast wave. Blast winds may achieve speeds up to 100 mph. Human fatality from tumbling begins at speeds of 50 mph. Ground impact with speeds of 21 mph can kill half of those affected.⁵ Once the blast wind passes, a reversal wind occurs, directed back toward the blast,¹ due to the underpressure vacuum that forms behind the blast wave.⁶

Not all blast events have a supersonic blast wave or blast wind. These phenomena are isolated to high-order explosives that detonate almost immediately, such as 2,4,6-trinitrotoluene (TNT), Composition C-4, nitroglycerin, dynamite, and ammonium nitrate-fuel oil.^{3,6} Low-order explosives, such as pipe bombs, gunpowder, and petrol bombs (Molotov cocktails), are caused by propellants that are designed to release energy slowly⁶ and have a subsonic wave (ie, slower than the speed of sound).⁷

Figure 1. A Blast Pressure Wave Over Time

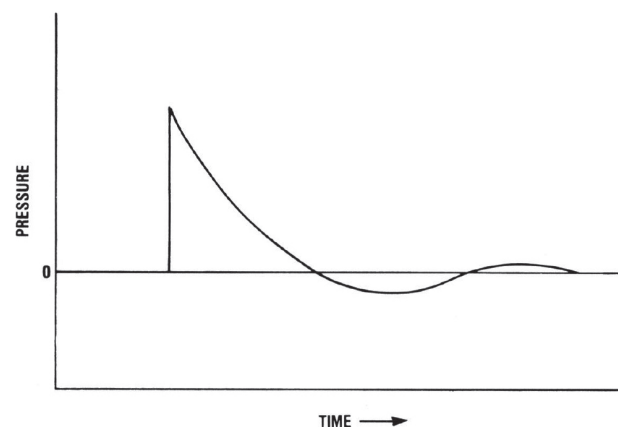


Image from United States Department of Defense. *Second United States Revision of the Emergency War Surgery NATO Handbook*. 1988. Washington, DC: US Government Printing Office.

Fracture Care in Trauma

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Bonus Video

Can't-Miss Orthopedics: Musculoskeletal Cases for the Urgent Care Provider (45 minutes)

Fracture Care in Trauma

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Bonus Video: Can't-Miss Orthopedics: Musculoskeletal Cases for the Urgent Care Provider

Dr. Melissa Leber discusses the diagnosis and management of orthopedic trauma injuries in this 45-minute video presentation. Go to the link or scan the QR code to access the video:

www.ebmedicine.net/Trauma3OrthoInjuries



Epidemiology of Fracture

Orthopedic injuries are common in blunt trauma.¹ The incidence of upper extremity fractures is 67.6 per 10,000 patients (all ages) per year.² The incidence of lower extremity fractures is 70 per 100,000 patients per year, and ankle fractures alone account for 49 per 100,000 patients per year.³ The reported rate of fractures in children ranges from 12 to 36 fractures per 1000 patients per year.⁴

General Management of Fractures

In the emergency department (ED), the history and physical examination, including neurologic and vascular examinations, aid in diagnosing musculoskeletal injuries. This guides initial management, stabilization, and imaging. Imaging often includes the joints proximal and distal to the injury. In general, radiographs for each suspected fracture should be performed in 3 views. Additional imaging studies, such as dedicated plain radiographic views, computed tomography (CT), or magnetic resonance imaging (MRI) may be necessary to confirm a diagnosis. In the pediatric population, comparison views with the contralateral bone can help diagnose fractures when radiographs are inconclusive.

The goal for treatment of any fracture is re-alignment of bony fragments and re-establishment of neurovascular anatomy to promote healing and functional restoration.⁵ This may be accomplished by immobilization, closed or open reduction, or operative repair.

Nomenclature and Classification

Specific nomenclature should be used to describe the fracture. Traditionally, the first descriptors are the anatomic location and whether the fracture is open or closed. The anatomic location should include laterality, the name of the bone, and standard descriptors or landmarks of the fractured bone. The documentation should indicate whether it is simple or comminuted, and the degree of displacement and malalignment. For more information on the correct charting of fractures, see the "Charting Commentary" on page 81.

Classification of Pediatric Fractures

Pediatric fractures involving the growth plate, or physis, are characterized using the Salter-Harris classification system. This system divides fractures by type, based on involvement of the metaphysis, physis, or epiphysis. (The types were originally described as I-V, though are often seen noted as 1-5.) Type I fractures extend through the physis, resulting in displacement of the epiphysis. Type II describes a fracture through the metaphysis and physis. Type III fractures extend through the epiphysis and physis. Type IV describes a fracture through the metaphysis, physis and epiphysis, and type V is a crush injury to the physis.⁶ (See Figure 1, page 74.)

High-Risk Fractures

Several fractures are associated with a high risk for significant morbidity and long-term disability, generally due to associated vascular or nerve injury, nonunion, malunion, infection, or avascular necrosis (AVN). AVN can result if there is interruption of the vascular supply to the fractured bone. Fractures of the scaphoid, lunate, and femoral neck are particularly susceptible to AVN.^{7,8} Delay in diagnosis or inappropriate initial management may increase the risks for complications, leading to pain, bone destruction, collapse, and the need for joint replacement.

Nonopioid Analgesic Modalities for Management of Acute Traumatic Pain

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Nonopioid Analgesic Modalities for Management of Acute Traumatic Pain

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Introduction

Provision of timely, effective, and safe analgesia for acute traumatic injuries in the emergency department (ED) results in significant reduction of patients' pain, improvement in the diagnostic workup, alleviation of anxiety and fear, and improved satisfaction of patients, their families, and staff members. In addition, it can significantly decrease or even abolish long-term negative physiological and psychological consequences of trauma.¹⁻³ The key attributes of efficient trauma pain management are prompt recognition and assessment of pain and utilization of pharmacological and non-pharmacological modalities for patient-specific, pain syndrome-targeted analgesia.^{1,3}

Despite the fact that opioids are the traditional cornerstone of traumatic pain management in the ED,^{4,5} several factors make their utilization less than optimal.⁶⁻⁸ These include the potential for serious morbidity and mortality in hemodynamically compromised trauma patients; unfavorable side effects such as hypotension and respiratory and central nervous system (CNS) depression; poor tolerance in geriatric trauma patients who may have multiple comorbidities and drug-drug interactions; and the potential for misuse, diversion, and the development of opioid use disorder.

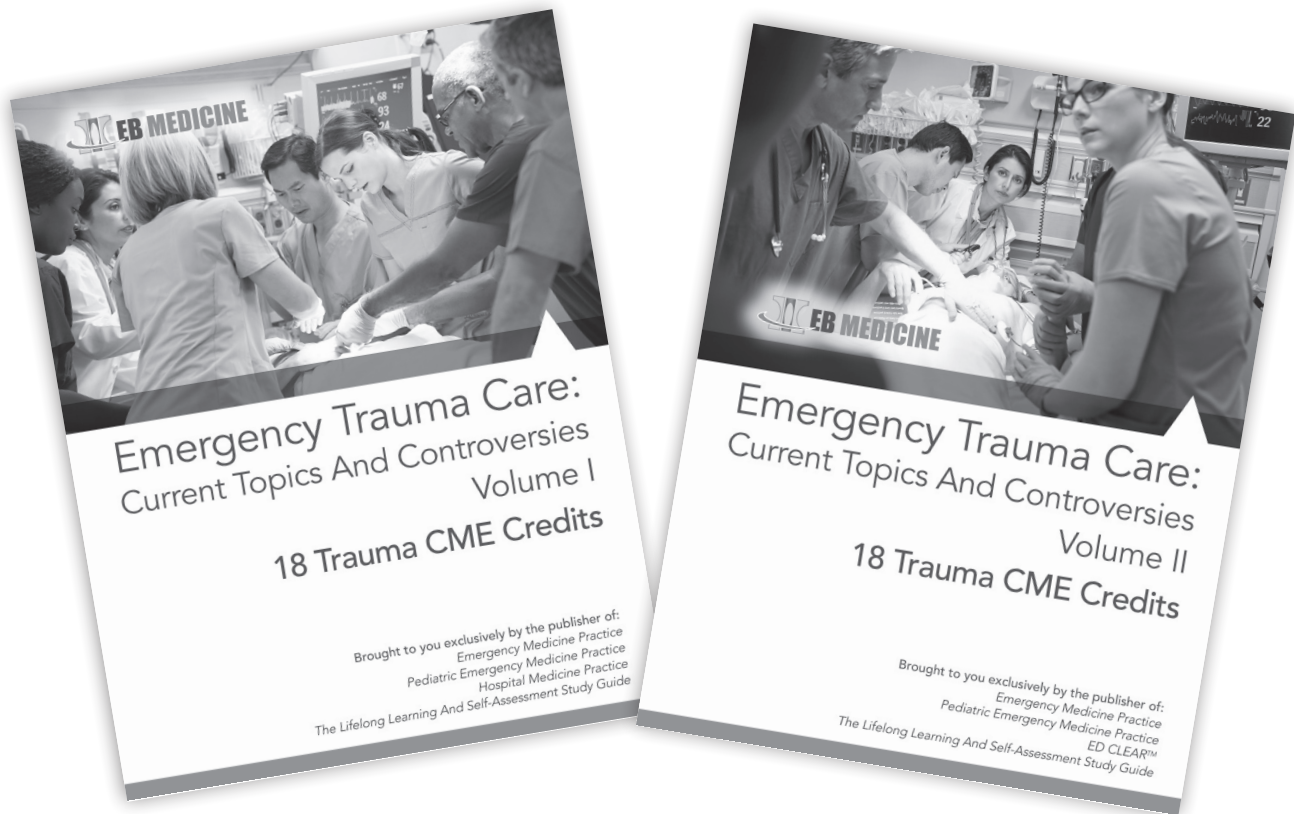
In recent years, our understanding of the neurobiology of pain has improved, allowing emergency clinicians to broaden their pharmacologic pain management beyond the use of opioid analgesics. This involves utilization of the concept of channels/enzymes/receptors-targeted analgesia (CERTA), which calls for a broader utilization of combinations of nonopioid analgesics in managing acute traumatic injuries in the ED and a more refined and judicious use of opioids.⁹⁻¹² However, this must also be balanced with an understanding of the specific risks and benefits of nonopioid analgesia as well as consideration of each patient's unique characteristics. Recent research in trauma care, anesthesiology, and emergency medicine promote the utilization of multimodal nonopioid analgesia in managing a variety of acute traumatic conditions.⁹⁻¹²

Acetaminophen

Acetaminophen (*N*-acetyl-*p*-amino-phenol [APAP, paracetamol]) is a *p*-aminophenol derivative that is used for a variety of painful conditions. It has multiple mechanisms of action that include potentiation of capsaicin/vanilloid-1 receptors, weak inhibitory activity of cyclo-oxygenase (COX) isoenzymes, and stimulation of endogenous opioid receptors.^{13,14} Acetaminophen provides modest analgesic effects. Based on available Cochrane reviews for nontraumatic pain, it may be no better than placebo.^{15,16} However, because it may be additive or synergistic with other modalities, consideration should be given to combining acetaminophen with other nonopioid analgesics and nonpharmacological treatment modalities for control of acute traumatic pain in the ED.^{16,17} Acetaminophen can be considered in concert with oral or topical nonsteroidal anti-inflammatory drugs (NSAIDs).

Acetaminophen is available in oral, rectal, and intravenous (IV) formulations, with time to peak plasma concentration being a major difference between formulations.¹⁸ In adult ED patients with acute traumatic pain due to sprain, strain, and bruising, oral acetaminophen should be administered at 500 to 1000 mg per dose. In a dental pain model, acetaminophen reaches its analgesic ceiling at 1500 mg in 24 hours. Three small randomized trials in patients with extremity and rib fractures found that, at 30 to 60 minutes post administration, IV acetaminophen at a 1-g dose administered over 15 minutes demonstrated comparable, and even superior, analgesic efficacy compared to 0.1 mg/kg of IV morphine. Similar rates of rescue analgesia were required, but there were significantly reduced rates of adverse effects.¹⁹⁻²¹ However, the nearly 100-fold cost differential of the IV form in comparison to the oral and rectal formulations is the major limiting factor to the use of IV acetaminophen in the ED.²² Based on cost and time constraints, the use of IV acetaminophen should be limited to patients with acute traumatic conditions who have an intolerance to or contraindications to opioids and NSAIDs and whose conditions preclude oral and rectal routes of acetaminophen administration.

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"I have already changed how I treat trauma-related pain. I learned how to improve use of different modalities for pain control."

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"I will use the FAST test more often."

"I anticipate increased use of ultrasound overall and decreased use of CT in stable and asymptomatic cases."

"I will focus more on establishing rapport with patients so I can reduce my chances of getting sued and improve patient satisfaction."

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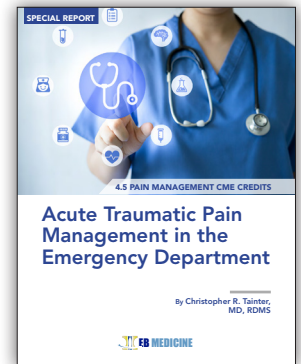
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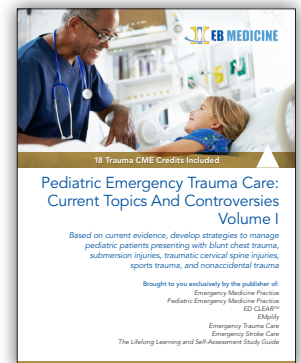
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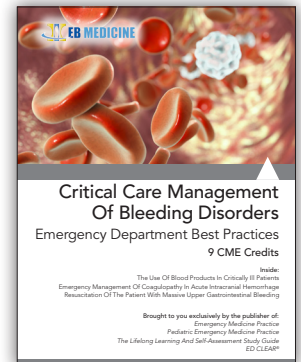
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