Emergency Medicine Update

A Case-Based Review of Recent Impactful Literature

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About Me

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- Practicing EM PA-C since 2012
- CAQ-EM in 2018
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Disclosures

No conflicts of interest

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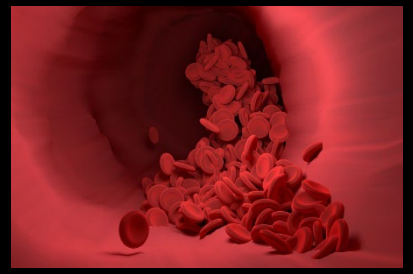
Learning Objectives

1. Utilize a stroke risk stratification system to determine outpatient versus inpatient management of transient ischemic attack.
2. Analyze risk versus benefit of venous thromboembolism prophylaxis in patients with closed ankle fractures.
3. Appraise the use of octreotide in the management of bleeding esophageal varices.
4. Outline the role of ultrasonography in soft tissue foreign body detection.
5. Discuss the efficacy of the PECARN criteria in detecting clinically important traumatic brain injury in pediatric patients.

Topics

Transient Ischemic Attacks

Ankle Fractures



Variceal Bleeding

Soft-tissue Foreign Bodies

Pediatric Head Trauma

Facial Burns

And more…

Case #1

A 57-year-old male presents to the ED with speech slurring that resolves within 25 minutes. No other neurologic, cardiac, or pulmonary symptoms.

History of hypertension & type 2 diabetes.

EKG – Normal sinus rhythm. BP 138/88, HR 85, RR 18, SpO2 100% RA. No focal neurologic deficits on exam. Cardiac & pulmonary exam unremarkable. CT of the head is normal – no bleed, shift, mass.

Photo: Pixabay/Engin Akyurt

Transient Ischemic Attack (TIA)

Transient neurologic dysfunction due to the brain, spinal cord, or retinal ischemia without acute infarction or tissue injury

Typically lasts <1 hour, often minutes

Risk-factors: diabetes, hypertension, age, smoking, obesity, alcoholism, poor diet, stress, lack of physical activity

TIA is a serious warning for impending ischemic stroke; the risk is highest within 48 hours.

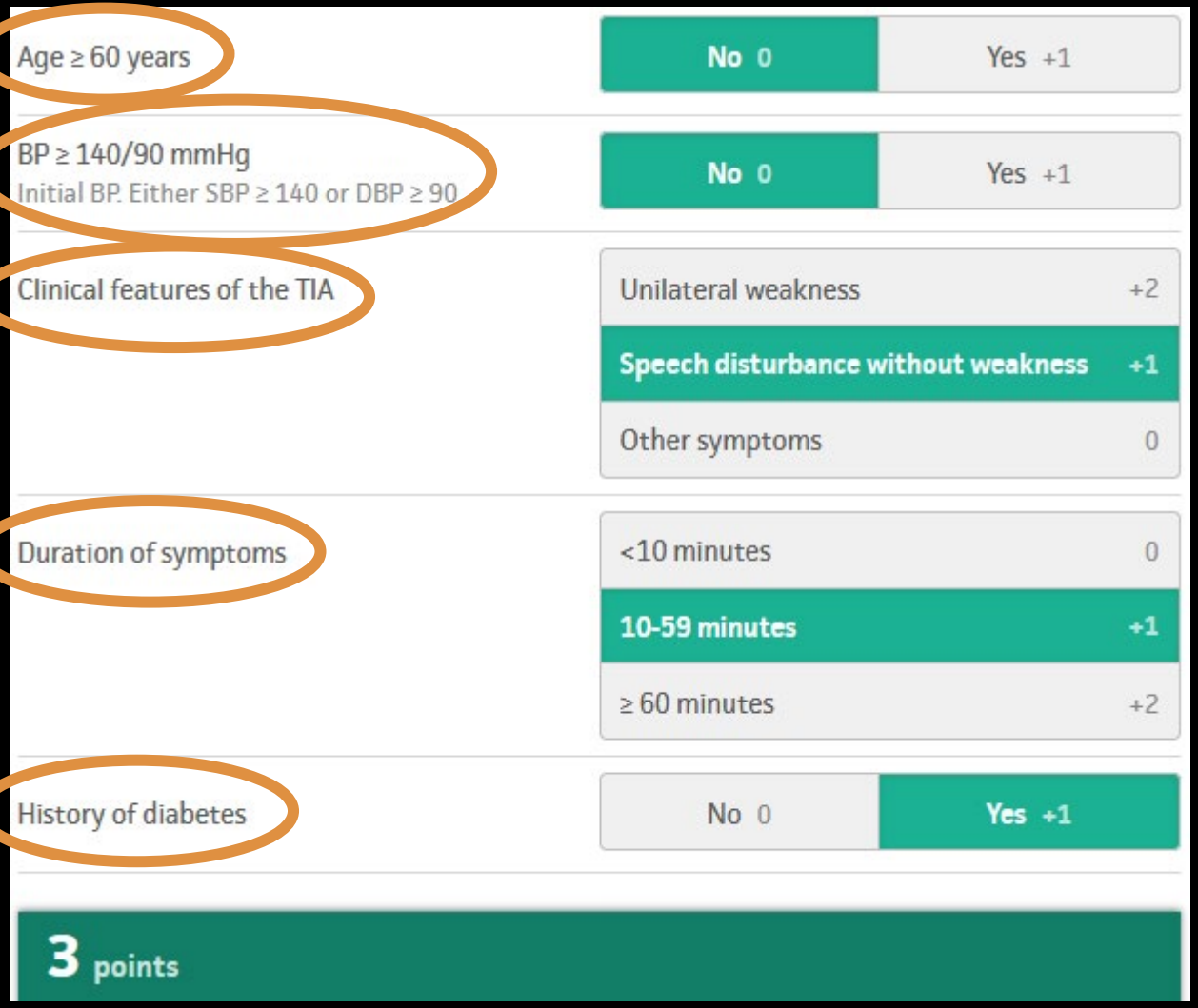
Panuganti KK et al, 2022

ABCD² Score for TIA

Low risk: 0-3 points

Moderate risk: 4-5 points

High risk: 6-7 points



Our Patient

Johnston SC et al, 2007
Josephson SA et al, 2008
Image: mdcalc.com

Risk of Subsequent Stroke Among Patients Receiving Outpatient vs. Inpatient Care for TIA

- Systematic review & meta-analysis of 71 articles between 1981-2018
- Evaluated risk of subsequent ischemic stroke among patients with TIA or minor ischemic stroke by location
- TIA clinic – rapid access TIA or neurology clinic in which patient was evaluated within 2 weeks of symptom onset
- Risk of stroke among patients evaluated in a TIA clinic was not higher than hospitalization

Patients in Analysis (n=226,683) mean [SD] age	Risk of Stroke	ABCD² Score >3
TIA clinic (n=5,636) 65.7 [3.9] years	7 days: 1.0% 90 days: 2.1%	52.2%
Inpatient (n=130,139) 78.3 [4.0] years	7 days: 1.2% 90 days: 2.8%	61.0%
Emergency Dept. (n=3,605) 68.9 [3.9] years	7 days: 3.4% 90 days: 3.5%	56.7%
Unspecified setting (n=87,303) 70.8 [3.8] years	7 days: 3.4% 90 days: 6.0%	70%

Shahjouei S et al, 2022

Case #1 Takeaways

Patient had a TIA with an ABCD² score of 3 (low risk of subsequent stroke)

Reasonable treatment options referral to a TIA clinic or admission, though TIA clinic is more cost effective

TIA clinics can be an effective component of TIA management

Patients who receive TIA treatment in ED without further follow-up had higher risk of subsequent stroke

Shahjouei S et al, 2022

Case #2

A 78-year-old female presents to the ED with an ankle injury after a mechanical fall down 3 stairs.

No prior DVT/PE or recent surgery.

The patient has a closed distal fibula fracture. She is neurovascularly intact.

A below-knee, sugar tong splint is applied.

Image: wallpaperflare.com

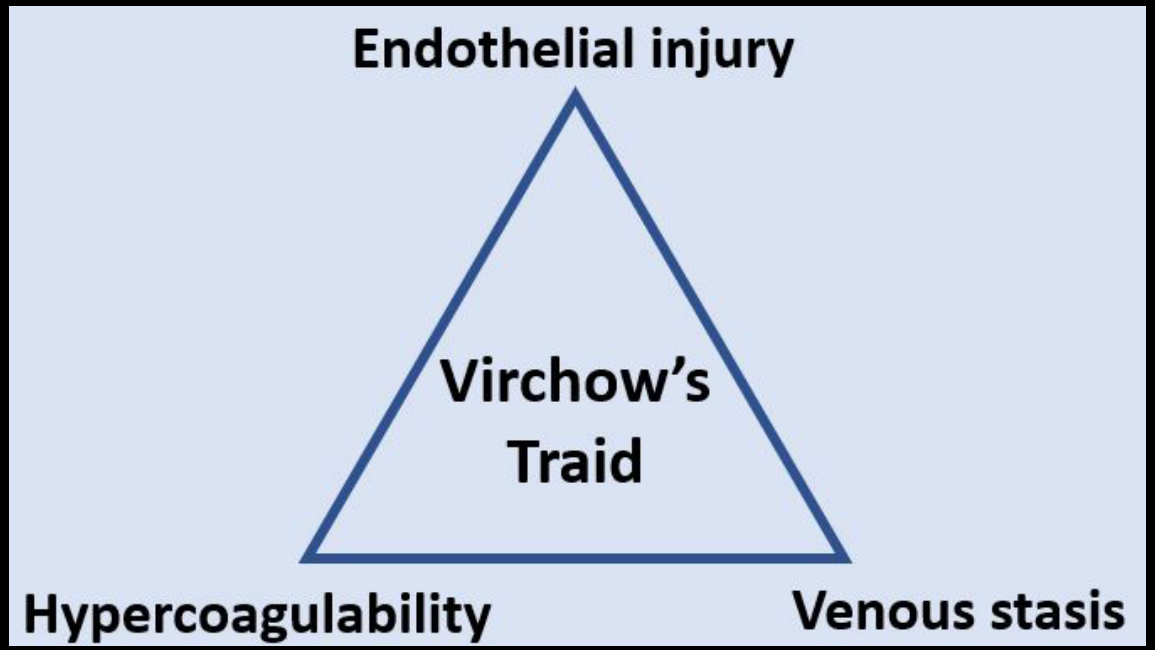
Venous thromboembolism (VTE)

Obstructive disease hindering venous return, most frequently involving lower limbs

Risk factors: Reduced blood flow, venous injury, hypercoagulability

May have history of pain, redness, swelling. Exam may show edema, red/warm skin, tenderness.

Treatment aims to prevent pulmonary embolism, usually with anticoagulation



Waheed SM et al, 2023

Image 1: https://citaty-slavnych.sk/autori/rudolf-virchow/
Image 2: Chandar V, Wikipedia CC License

Venous Thromboembolism in Patients Discharged from the ED with Ankle Fractures

- Retrospective cohort study
- Propensity score matched to 2 controls (finger wounds and wrist fractures) to compare relative hazard of VTE
- 90-day incidence of VTE among splinted, discharged ankle fractures was 1.3%
- These patients had a 5.7-6.3-fold increased hazard compared to controls

Factors Associated with VTE	Hazard Ratio; 95% Confidence Interval (CI)
Age >65	HR 1.18 95% CI 1.00-1.39
History of VTE or superficial VTE	HR 5.18 95% CI 4.33-6.20
Recent admission	HR 1.33 95% CI 1.05-1.68
Recent non-ankle fracture surgery	HR 1.58 95% CI 1.30-1.93
Subsequent ankle fracture surgery	HR 1.80 95% CI 1.48-2.20

Grewal K et al, 2021

Case #2 Takeaways

Incidence of VTE in this study was overall low, but ankle fractures with immobilization did increase risk

Literature is unclear exactly which patients would benefit from thromboprophylaxis

Our patient was >65 and thus at even higher risk for VTE associated with her splinted ankle fracture

In most patients, risk of thromboprophylaxis outweighs benefit; however, it may be worth considering in patients with prior DVT/PE

VTE should be in the differential diagnosis for splinted ankle-fracture patients returning with leg redness or pain.

Grewal K et al, 2021

Case #3

A 48-year-old male with a PMH of esophageal varices and portal hypertension presents to the ED with hematemesis. He is actively vomiting bright red blood.

He was admitted several months ago for an upper GI bleed (UGIB) from varices, confirmed on endoscopy, and underwent banding.

Vital signs include BP 90/50, HR 110, RR 22, Temp 98.6F, SpO_2 96% on RA.

After a physical exam and cardiopulmonary stabilization, IV crystalloids, packed red cells, pantoprazole, and octreotide are ordered.

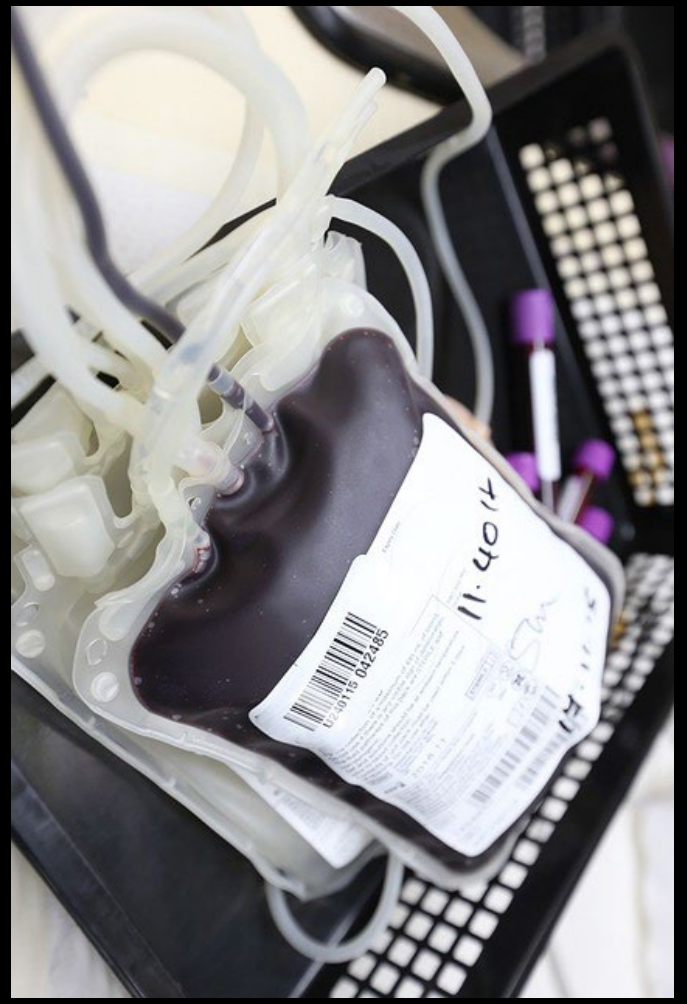


Image: Pixabay/Ahmad Ardity

Esophageal Varices

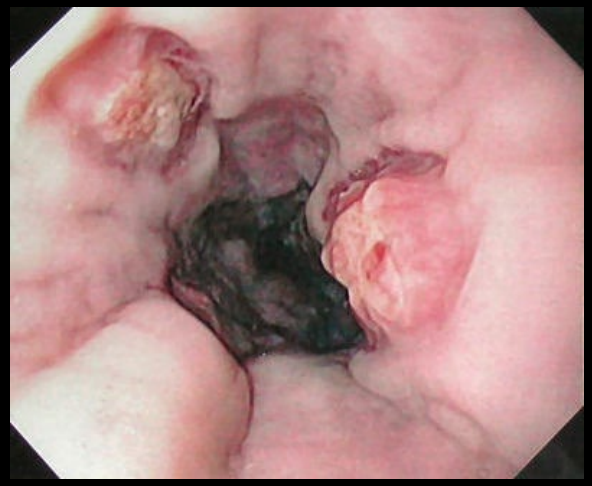
Dilated, submucosal distal esophageal veins connecting portal & systemic circulation

Form due to portal hypertension

3rd MCC of Upper GI Bleeding (UGIB)

10-20% mortality in 6 weeks following initial bleed

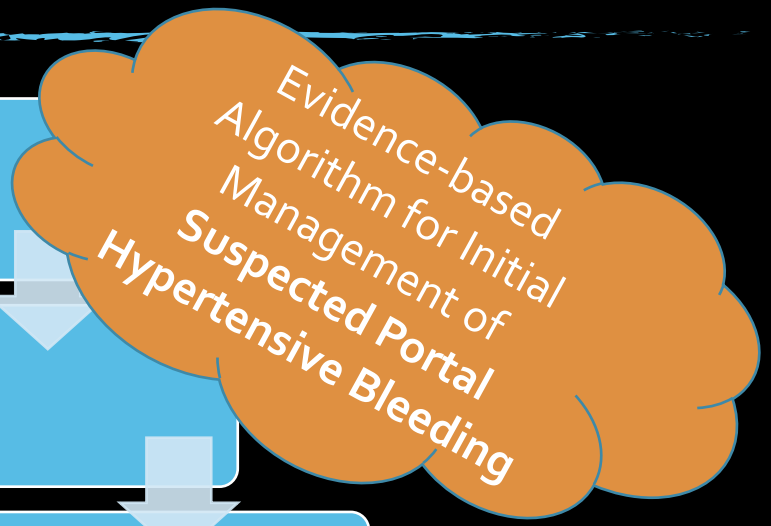
Infection is likely – spontaneous bacterial peritonitis, UTI, pneumonia



Meseeha M et al, 2023

Images: Wikipedia/Samir

2021 AGA Clinical Practice Update on Management of Bleeding Gastric Varices



ABC's

- 2 large bore IVs; intubate if necessary

Vasoactive Drug Administration

- Octreotide 50mcg IV and 50mcg/hour drip; co-admin of PPI not required

Antibiotic Prophylaxis

- Ceftriaxone 1g/day

Restrictive RBC Transfusion

- Threshold of 7mg/dL; goal maintenance Hgb 7-9 mg/dL

Urgent Endoscopy & Intensive Care Unit Admission

- Scope < 12 hours; consider erythromycin 250mg IV before endoscopy

Henry Z et al, 2021

Octreotide for Gastrointestinal Hemorrhage from Esophageal Varices

Systematic review of 21 RCTs with 2,588 patients comparing somatostatin analogues to placebo

Adding somatostatin to routine care did not reduce mortality or risk of rebleeding

Average units of blood transfused reduced by 0.7 units (95% CI 0.2-1.1) in high quality trials and 1.5 units (95% CI 0.9-2.0) in low quality trials

Academic Emergency Medicine assigned "red" (no benefit) status for octreotide as a variceal bleeding treatment in 2019.

Li JJ et al, 2019

Case #3 Takeaways

Care was provided per AGA guidelines when octreotide was administered to our patient

There may be no survival benefit and no prevention of rebleed with somatostatin analogue use

Harms were not assessed in this study

Consider a discussion with GI about octreotide administration in variceal bleeding cases.

Li JJ et al, 2019

Case #4

A 12-year-old male presents to the ED with suspicion of a wood splinter in his palm.

No visible sign of splinter on exam. Diffuse abrasions present. Patient has mild tenderness to palpation of his thenar eminence.

No neurovascular injury patterns.

Image: wallpaperflare.com

Soft Tissue Foreign Bodies (FB)

Very problematic – easily missed & common cause of litigation

Can cause infection, hypersensitivity reactions, severe inflammation

Imaging necessary for suspected FB not identified on exam

Radiopaque vs. radiolucent is not binary

USUALLY Radiopaque
Metal
Gravel / rock
Glass (esp. leaded)

USUALLY Radiolucent
Wood
Plastic
Organic material

Campbell EA et al, 2022
Halverson M et al, 2013

Image: StatPearls/Dryer MA

Ultrasonography in Soft-tissue FB Detection: a Phantom Study

740 chicken breasts prepared as phantoms (100 as controls)

FB: glass, porcelain, plastic, wood, pencil tip, chicken bone, iron, walnut, fishbone, rose thorn, cactus thorn, staples, pellets

Sensitivity >82.5% for all objects EXCEPT cactus thorn

Specificity > 90% for all objects EXCEPT cactus thorn

As the size of the FB increased, sensitivity increased

Tok S et al, 2021

Image 1: Pixnio/D. Cartagena
Image 2: Pixabay

Case #4 Takeaways

Cacti & associated thorns are the worst

Surgery consult / exploration indicated for suspected FB not identified on imaging

We ultrasounded our patient's hand – positive for 2 cm wood splinter, removed at bedside

Ultrasonography is a valuable adjunct to identifying soft tissue foreign bodies.

Tok S et al, 2021

Case #5

An 18-month-old infant presents to the ED after rolling off the couch 2 feet onto the floor and hitting his head 1 hour ago.

No LOC. The patient is acting normally, per dad.

Vital signs normal. Patient acting appropriately for age. No neuro deficits. No palpable skull fractures or hematomas.

Image: Pixabay

Pediatric Blunt Head Trauma

800,000 children present to ED with blunt head trauma annually in U.S.

Majority of children present with minor head trauma (GCS 14-15)

Of those with minor head trauma who undergo CT, most have no findings

Minimizing radiation exposure and/or risks of sedation is important

What to do? PECARN

Bressan S et al, 2021

PECARN Algorithms for Minor Head Trauma: Risk Stratification Estimates from a Prospective PREDICT Cohort Study

Secondary, prospective, multicenter analysis of 15,163 children with GCS of 14 or 15

Calculated clinically important TBI (ciTBI) rates for each PECARN risk category

Very Low Risk Groups	Intermediate Risk Groups	High Risk Groups
• 0% risk of ciTBI in both groups	• Children 2+: All 4 risk factors highest risk (25%); combination of severe mechanism and severe headache 2nd highest (7.7%) • Children <2: Insufficient data	• Children <2: highest risk factor was signs of palpable skull fracture • Children 2+: greatest risk factor was signs of basilar skull fracture

Bressan S et al, 2021

Case #5 Takeaways

Risk estimates of ciTBI for each PECARN algorithm risk group were consistent with original PECARN study

Our patient was in very-low-risk category; no CT ordered after shared decision making with parent

PECARN algorithm is a helpful clinical decision tool in pediatric blunt head trauma with a GCS of 14-15.

Kuppermann N et al, 2009
Bressan S et al, 2021

Case #6

A 41-year-old male presents to the ED after a house fire.

HR 130, RR 25, SpO2 90% RA. He has singed facial hair, carbonaceous sputum, and hoarseness, but no overt facial burn.

Total body surface area (TBSA) burned 65%.

Inhalation injury

Smoke inhalation is common in patients exposed to fires

Damage is due to heat (to level of larynx) and chemical byproducts (airways, alveoli, or both)

Important to elucidate if exposure was d/t flames, smoke, and or chemicals.

Airway can become rapidly edematous, mucous production increases, bleeding is possible

Current guidelines advise endotracheal intubation for facial burn patients & consideration of early intubation for patients with physical exam findings concerning for inhalation injury.

Image: : Li Y et al, 2022

Shubert J et al, 2022
Clark C et al, 2022
Huang R et al, 2022

Positive Signs on Physical Exam are Not Always Indications for Endotracheal Tube Intubation in Patients with Facial Burn

Retrospective analysis of 335 facial burn patients with & without intubation in ED

121 patients intubated in ED, including all patients with total body surface area (TBSA) >60% even without signs of inhalation injury

Only 60.3% of patients found to have inhalation injury on bronchoscopy

Independent risk factors for inhalation injury
Shortness of breath (p=0.027)
High TBSA (p=0.001)

Non-predictive risk factors for inhalation injury
Hoarseness
Burned nostril hair
Cough
GCS Score
Laboratory examinations
Abnormal CXR findings

Huang et al, 2022

Case #6 Takeaways

Our patient was intubated due to concern for inhalation injury & need for airway protection

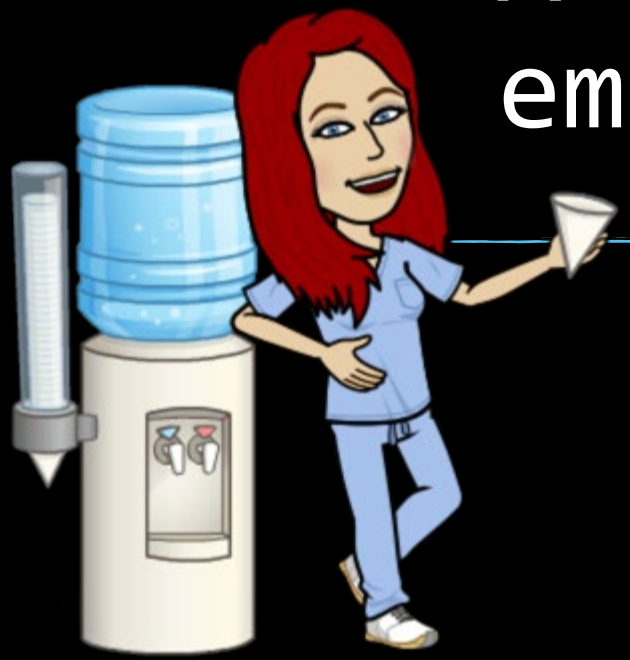
Conventional physical exam findings may not predict inhalation injury & need for intubation

Airway protection may be needed in patients with facial burns without inhalation injury

In facial burns, shortness of breath & high TBSA are significant predictors of inhalation injury.

Huang et al, 2022

A few other important/cool emergency medicine studies…



Association of Tramadol vs. Codeine Prescription Dispensing with Mortality and Other Adverse Outcomes

Retrospective, population-based, propensity score-matched cohort study

Tramadol vs. codeine new prescriptions on mortality and adverse clinical outcomes in outpatients

New prescription of tramadol was significantly associated with a higher risk of all-cause mortality, cardiovascular events, and factures compared to codeine

Outcomes (n=368,960 patients; 184,480 propensity matched pairs)		
	Tramadol	**Codeine**
All-Cause Mortality (per 1,000 person years)	5.61	13
Cardiovascular events (per 1,000 person years)	10.03	8.67
Fractures (per 1,000 person years)	12.26	8.13
Risk of Falls	No significant difference	
Delirium	No significant difference	
Constipation	No significant difference	
Opioid Abuse / Dependence	No significant difference	
Sleep Disorders	No significant difference	

Xie J et al, 2021

Early Extracorporeal CPR for Refractory Out-of-Hospital Cardiac Arrest (INCEPTION trial)

- Multicenter RCT comparing extracorporeal CPR (E-CPR) vs. conventional CPR (ACLS)
- Included patients between 18-70 years old who received bystander CPR, had an initial ventricular arrhythmia, and no ROSC within 15 minutes after CPR
- Primary outcome was survival with a favorable neurologic outcome at 30 days

Suverein MM et al, 2023

Image: Pixabay

Early Extracorporeal CPR for Refractory Out-of-Hospital Cardiac Arrest (INCEPTION trial)

Cannulation & circulation successful in 46 of 52 in E-CPR

E-CPR 18 (26%) achieved ROSC

ACLS 20 (31%) achieved ROSC

30-day survival with favorable neurologic outcome: E-CPR 14 (20%), ACLS 10 (16%) p=0.52

In out-of-hospital cardiac arrest, E-CPR & ACLS had similar survival effects with favorable neuro outcome

Baseline Patient Characteristics		
	E-CPR (n=70)	ACLS (n=64)
Age	54 (±12)	57 (±10)
Primary Shockable Rhythm	69 (99%)	63 (98%)
Witnessed Arrest	68 (97%)	63 (98%)
CPR started within 5 mins	69 (99%)	61 (95%)
Total # of Defibrillations	8±5	9±6
Pre-Hospital Randomization	44(63%)	42 (66%)
Time from cardiac arrest to ED in mins	36±12	38±11
Emergency Call to ROSC time in mins	49±19	43±20

Suverein MM et al, 2023

High-dose Cephalexin for Cellulitis: a Pilot Randomized Controlled Trial

Cellulitis oral antibiotic treatment failure is 20%

High-dose cephalexin (1000 mg) vs. standard-dose cephalexin (500 mg) PO 4x daily x 7 days

Inclusion: Age 18+ presenting to ED with non-purulent cellulitis and appropriate for outpatient management with oral antibiotics

69 patients included in pilot study

Yadav K et al, 2023

Image: Wikimedia/RafaelLopez

High-dose Cephalexin for Cellulitis: a Pilot Randomized Controlled Trial

Primary Outcome: Oral antibiotic treatment failure

33 participants in each arm

Standard-dose treatment failure: 12.9% (n=4)

High-dose treatment failure: 3.2% (n=1)

Minor adverse events higher in high-dose arm, but no unplanned hospitalizations within 14 days

No practice changes yet, but full-scale trial is pending

Yadav K et al, 2023

Early Restrictive of Liberal Fluid Management for Sepsis-Induced Hypotension (CLOVERS trial)

- Multicenter unblinded superiority trial of restrictive fluids vs. liberal fluids for 24 hours
- Restrictive fluid group = more vasopressors
  Liberal fluid group = fluids before vasopressors
- Randomization occurred within 4 hours after patients met criteria for sepsis-induced hypotension
- Primary outcome: death before discharge home by day 90

NHLBI et al, 2023

Image: Defense Visual Information Distribution Service/DOD

Early Restrictive of Liberal Fluid Management for Sepsis-Induced Hypotension (CLOVERS trial)

Death before d/c home by 90 days:

Restrictive 109 (14%)

Liberal 116 (14.9%)

P=0.62

Similar adverse events between groups

Restrictive fluid strategy did not result in significantly lower or higher mortality than liberal fluid strategy

Baseline Patient Characteristics & Intervention Data		
	Restrictive (N=782)	**Liberal (N=781)**
Age	59.1 (±16.0)	59.9 (±15.9)
SOFA Score	3.4±2.8	3.5±2.7
Systolic BP mm Hg	93.2±12.0	93.8±12.2
Median volume of IVF given before randomization	2050 (1500-2457)	2050 (1371-2442)
% of patients receiving vasopressors before randomization	21%	18%
Median IVF given during 1st 6 hours post-randomization	500 mL	2300 mL
Cumulative median IVF given in 24 hours post-randomization	1267 mL	3400 mL
% of patients receiving vasopressors after randomization	59%	27%

NHLBI et al, 2023

Utility of Serum Lactate on Differential Diagnosis of Seizure-like Activity: a Systematic Review & Meta-analysis

Transient loss of consciousness (TLOC) presents frequently to the ED; etiology is often unclear

Primary outcome: serum lactate level difference between a patient with generalized tonic-clonic seizures (GCTS) vs. other forms of TLOC

Eight studies, 1,348 total patients

Serum lactate levels in GCTS significantly higher than TLOC from any other cause (p=0.004)

Serum lactate level ≥ 2.4 mmol/L (normal 0.5-2.2 mmol/L) allowed differentiation between GTCS and non-GCTS & can be a valuable differentiating tool but not used for definitive diagnosis

Patel J et al, 2022

Key Points

- Patients who receive TIA treatment in ED need outpatient follow up as quickly as possible & within 2 weeks.
- VTE should be in the differential diagnosis for splinted ankle-fracture patients returning with leg redness or pain.
- Octreotide may have no patient-centered benefits when used for variceal bleeding.
- Ultrasonography is a valuable adjunct to identifying soft tissue foreign bodies.
- The PECARN algorithm is a helpful clinical decision tool in pediatric blunt head trauma with a GCS of 14-15.
- In facial burns, shortness of breath & high TBSA are significant predictors of inhalation injury.

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