
2020

EM CASES COURSE

PRE-COURSE WORKBOOK



AM: Shoulder Injuries | Vertigo | Burn & Electrical Injuries
PM: Polytrauma | Awake Intubation | Pulmonary Embolism

Instructions for Getting the Most Out of The EM Cases Course Workbook

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Morning Modules

1. **Should Injuries pg 2**
2. **Vertigo pg 5**
3. **Burn & Electrical Injuries pg 7**



Shoulder Injuries

With Arun Sayal

PODCASTS TO LISTEN TO PRIOR TO THE COURSE

Link to: Shoulder Injuries (unpublished sneak peak) *available starting Jan 24th

Link to: Cunningham lecture

The shoulder has been described as the most complex joint in the human body. While anterior shoulder dislocations and proximal humerus fractures are common and relatively simple to manage there are various shoulder injuries that are easy to miss and/or a challenge to manage. Dr. Sayal will guide us through these challenging cases.

Case 1: House Party!

A 35-year-old man comes in with a friend from a house party where he drank excessively. According to his friend who's sober, they were horsing around in front of the house and he tripped, and had an awkward fall on the arm on the pavement. He's been holding his arm against his body ever since refusing to move it. He's tender around the entire shoulder (he's difficult to examine - he's really drunk) and you can't get him to move his shoulder at all.

You send him for 3 view of the shoulder, and you don't see a fracture.

Q1: What is your differential diagnosis for a painful joint with a normal appearing x-ray?

SCARED OF mnemonic

Q2: Why are posterior shoulder dislocations often missed?

Q3: What are the key clinical and x-ray clues to diagnosing a posterior shoulder dislocation?

Q4: How will you attempt to reduce this posterior shoulder dislocation? How will you immobilize the patient with a posterior shoulder dislocation differently from an anterior shoulder dislocation?

Cunningham lecture

<https://www.youtube.com/watch?v=d9HjtQroc64>

Q4: What is your differential diagnosis for a shoulder injury with an apparently normal set of standard x-rays?

Case 2: Fracture-Dislocation

An 82 year old female with a history of moderate dementia, diabetes and renal insufficiency, is sent in from a nursing home after an unwitnessed fall next to her bed. On exam there are no signs of head injury. The only obvious injury is of the shoulder which is swollen and bruised. She is sent for x-rays which show a humeral surgical neck fracture and anterior glenohumeral dislocation.

Q1: How will you manage this patient?

Q2: Which patients with proximal humerus fractures should get a simple sling vs Velpeau shoulder immobilizer vs 'collar and cuff' vs sugar tong splint?

Q3: When should ROM exercises be started for patients with proximal humerus fractures?

Q4: What is the utility of POCUS in shoulder dislocations and rotator cuff injuries?

Making Vertigo Less

Dizzy-ing

With Walter Himmel & Rick Penciner

PODCAST TO LISTEN TO & READING PRIOR TO THE COURSE

Link to: **Swadron on Vertigo from EMU 2014**

Link to: **Himmel's Dizzinees & Vertigo talk from EMU 2017** (**starts at minute 49**)

Link to: **Himmel's Dizziness & Vertigo Notes from EMU 2017**

Link to: **Himmel's Quick Hit on Nystagmus** (**starts at minute 7**)

Link to: **Drugs that Work & Drugs that Don't** (**starts at minute 17:00**)

In this workshop, Dr. Penciner and Dr. Himmel will guide you through how to identify, work up and manage those patients with life-threatening or long term debilitating causes of vertigo - a not-so-uncommon reason for medico-legal action when missed.

Case 1: About to barf AND the room is spinning!

A 46-year-old emergency physician and podcaster presents to your ED with an abrupt onset of vertigo and vomiting that came on while he was doing his daily yoga routine. On exam his vitals are normal but he looks pale and is holding on to the bed rail with both hands.

Q: What features on history would make you reassured that the diagnosis was benign one vs. a stroke? On physical?

Q: When is it appropriate to apply the Dix-Hallpike maneuver and the HINTS test? How do you interpret them?

VIDEO LINK for HINTS exam:

<http://emcrit.org/misc/posterior-stroke-video/>

Q: Which patients with vertigo require imaging in the ED?
Which imaging modality in particular?

Q: Which patients with vertigo require referral to a stroke clinic or neurologist? Admission?

Q: Which medication(s) is(are) best for vertigo in the ED and after discharge? Which maneuvers are best to treat BPPV and how do you instruct the patient to do them?

Vertigo References

1. Clinical practice guideline: Benign paroxysmal positional vertigo. Bhattacharyya, n et al. Otolaryngology-Head and Neck Surgery 2008; 139: 47-81.
2. Does my dizzy patient have a stroke? A systematic review of bedside diagnosis in acute vestibular syndrome. Tarnutzer, MD et al. CMAJ 2011; 183(9):571-592.
3. HINTS to diagnose stroke in the Acute Vestibular Syndrome: Three-step bedside oculomotor examination more sensitive than early MRI diffusion-weighted imaging. Kattah, JC et al. Stroke 2009; 40: 3504-3510.

Burn & Electrical Injuries

With Joel Fish & Maria Ivankovic

PODCAST TO LISTEN TO PRIOR TO THE COURSE

Link to: [Burn & Inhalation Injuries](#)

Link to: [Electrical Injuries - The Tip of the Iceberg](#)

While the prevalence of burn and electrical injuries are thankfully decreasing in North America there is a lot of room for improvement in ED management, counselling and disposition. Things like inaccurate estimation of burn size, unnecessary endotracheal intubation, over- and under-estimation of fluid resuscitation volumes, inadequate analgesia and inappropriate wound dressings are just some of the issues where a small change to ED practice patterns could have a huge impact on patient care.

Case 1: Scald Burn

A 2 year old boy otherwise healthy boy comes in with his mother after placing the palm of his hand on a stovetop element. Immunizations are up to date. His mother placed ice immediately on the his burned palm but he could not tolerate it. In the ED 30 minutes later he is screaming and crying. Vital signs show moderate tachycardia and otherwise are normal. His right palm and fingers are red and blistering. There are no other obvious signs of trauma.

Q1: What is your general approach to this child? How would you control pain in this case?

Q2: What is the best recommended first aid for burns?

Q3: How would you classify the burn and what are the main pitfalls in assessing and classifying burns in the ED?

Q4: What are key principles in burn wound management and follow up? Does this patient require oral antibiotics?

Case 2: House fire

EMS brings in an otherwise healthy 46 year old female burn victim from a house fire. On arrival she's coughing and wheezy with soot around the nares. Vitals are normal except moderate tachycardia and oxygen saturation of 93% on oxygen by mask. No stridor, normal voice, clear oral cavity, mild erythema covering the anterior neck and about 2/3 of the face. Most of the the upper torso is red and blistering as well as the shoulders and arms.

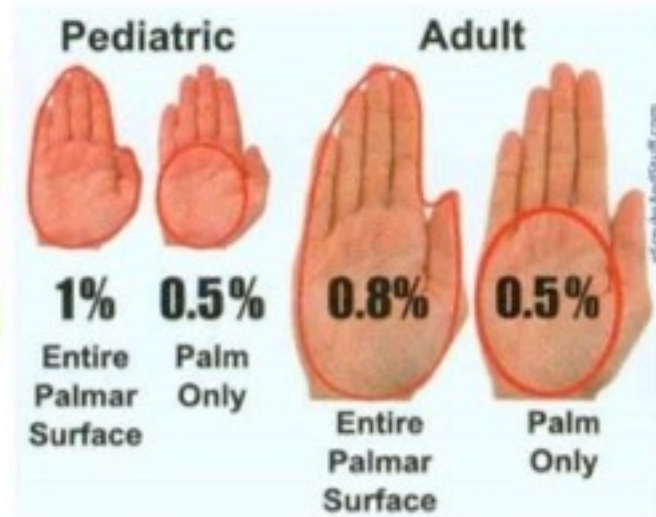
Q5. What is your general approach to this burn patient?

Q6. How do you estimate the size of the burn to guide fluid therapy?

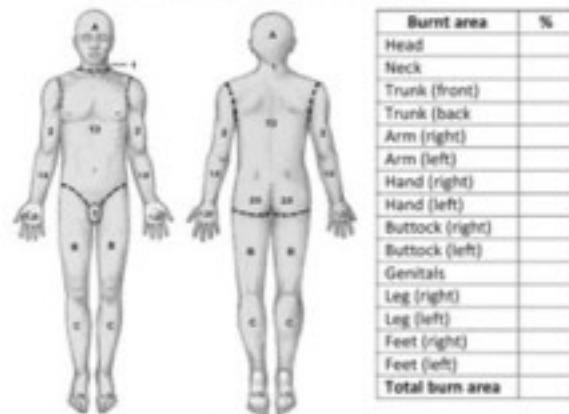
Rule of Palms

Use PATIENT's hand & ENTIRE palmar surface

Good for TBSA < 15%



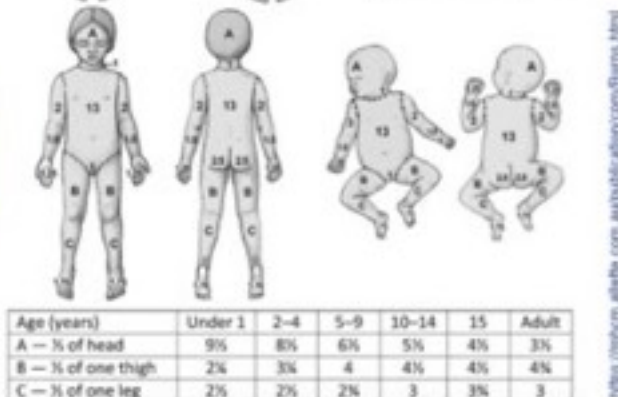
Lund and Browder Charts for area of body burnt



A

Lund & Browder Chart

✓ Highest accuracy & inter-rater reliability



MODIFIED BROOKE/PARKLAND FORMULA

(Burns >15% BSA children, >20% adults)

Volume of Ringer's Lactate =
2mL-4mL x %BSA x weight (kg)

1/2

1/2

FIRST 8HRS

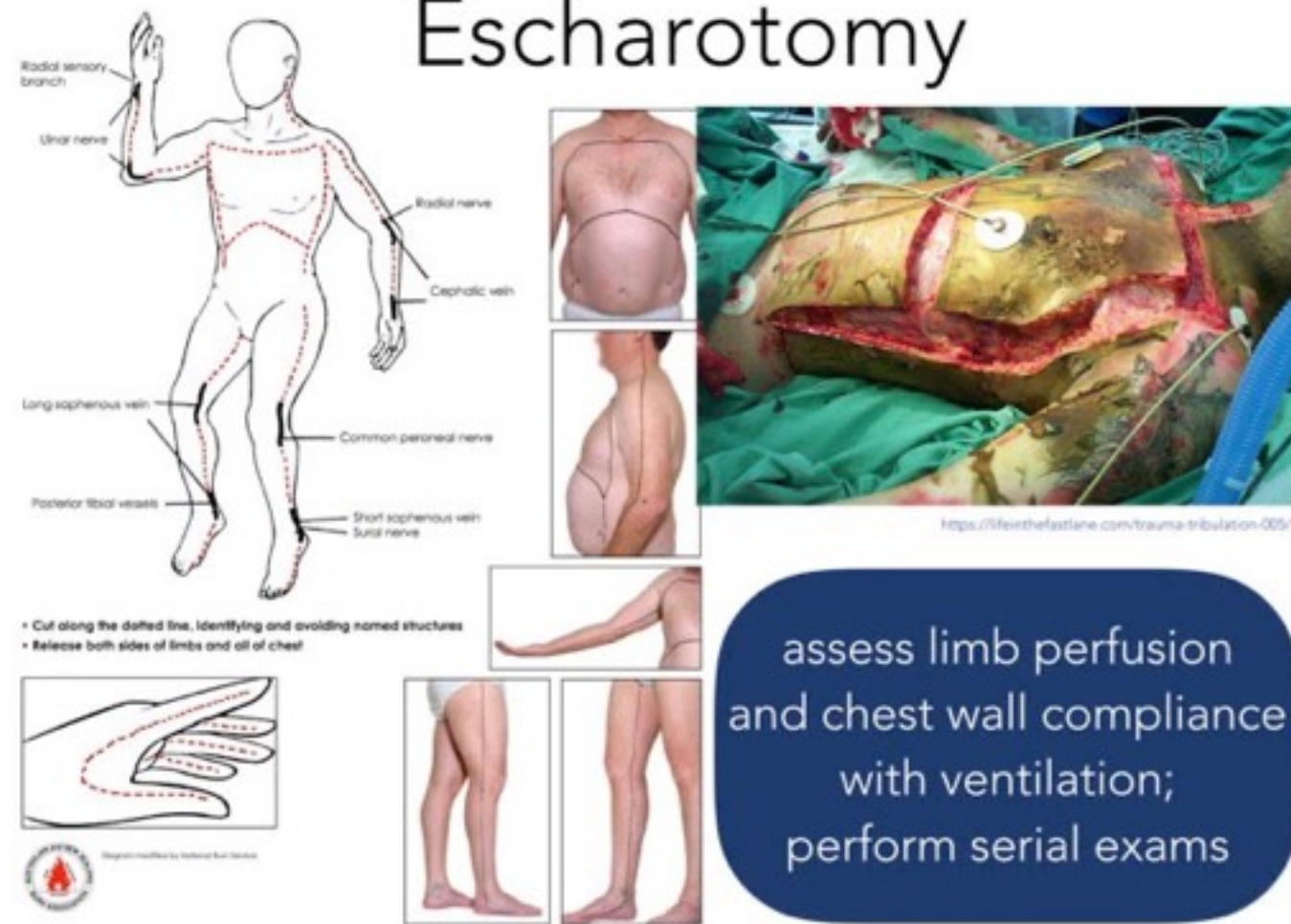
NEXT 16HRS

TITRATE TO URINE OUTPUT OF 30-50CC/HR (KIDS 1CC/KG/HR)

Q7: Does this patient require endotracheal intubation now?
What are the factors to consider in airway management of burn and inhalation injury patients?

Q8: What are the indications for an ED escharotomy and how does this differ from a fasciotomy?

Escharotomy



Q9: The lactate comes back at 9 and the venous blood gas shows an anion gap metabolic acidosis. How would you adjust your management of this patient?

Case 3: Struck down from a telephone pole

You're called to the resus room for a 54 year old male who was installing a telephone pole when his co-worker witnessed him accidentally touching a power cable, which he was "stuck to" for about 5 seconds and he saw a spark come off his back. On arrival his GCS is 14 and there are obvious severe electrical burns to both arms and across his abdomen. He's complaining of abdominal, leg and arm pain and his vitals are normal except for a moderate tachycardia.

Q10. How can you predict the extent of internal injury in this patient?

Q11: What are the immediate life threats that need to be identified and managed in the first hour in the ED in this patient?

Q12: What are the expected cardiac complications of electrical injuries and how do you work them up in the ED?

Q13: How is fluid management different in the electrical injury patient compared to a patient with a scalding burn?

Q14: Which patients with electrical injuries require cardiac monitoring? Admission? If sending this patient home, what are important delayed injuries we should be aware of and how should we counsel patients about them?

References

Cuttle L, Pearn J, McMillan JR, Kimble RM. A review of first aid treatments for burn injuries. *Burns*. 2009;35(6):768–775.

Quinn K, Kriss S, Drapkin J, et al. Analgesic Efficacy of Intranasal Ketamine Versus Intranasal Fentanyl for Moderate to Severe Pain in Children: A Prospective, Randomized, Double-Blind Study. *Pediatr Emerg Care*. 2018.

Avni T, Levcovich A, Ad-El DD, Leibovici L, Paul M. Prophylactic antibiotics for burns patients: systematic review and meta-analysis. *BMJ*. 2010;340:c241.

Harshman J, Roy M, Cartotto R. Emergency Care of the Burn Patient Before the Burn Center: A Systematic Review and Meta-analysis. *J Burn Care Res*. 2019;40(2):166-188.

Otterness K, Ahn C, Nusbaum J, Gupta N. Emergency Department Management of Smoke Inhalation Injury in Adults. *Emerg Med Pract*. 2018;20:1-2.

Tolles J, Gupta N, Nusbaum J. Emergency Department Management of Patients with Thermal Burns. *Emerg Med Pract*. 2018;;20:1-24.

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Afternoon Modules

1. **Adult Polytrauma pg 13**
2. **Awake Intubation pg 16**
3. **Pulmonary Embolism 20**



Adult Polytrauma Patient

With Andrew Petrosoniak & Kylie Booth

PODCASTS TO LISTEN TO PRIOR TO THE COURSE

Link to: [Trauma: The First & Last 15 Minutes P1](#)

Link to: [Trauma: The First & Last 15 Minutes P2](#)

Link to: [Massive Transfusion in Trauma Video](#)

Link to: [Rapid Review Video Polytrauma](#)

Link to: [Cerebrovascular Injury](#) (*min 29:43)

Management of the polytrauma patient for most of us is a relatively rare event. Standard ATLS falls short in many respects and we can probably do better than that. In this workshop, Drs. Booth and Petrosoniak will guide you through the management of a typical polytrauma patients so that you can learn how to prioritize your actions like an experienced trauma team leader no matter where you work!

Case 1: The ATV Crash

You are the ED physician in a rural hospital. You have access to a CT scanner, point of care ultrasound, and labs. The regional trauma centre is a two hour drive away. You get a call that a helmeted 24 year old man has been involved in an ATV crash. His ATV flipped while going down a steep incline and he was caught underneath it during the rollover. EMS reports that he has obvious trauma to the left side of the chest, bruising over the abdomen, and an open left tibia fracture. GCS of 13. ETA to your ED is 5 minutes.

Q1: You have 5 minutes to prepare prior to patient arrival. How do you prepare yourself, your gear, your environment and your staff?

Q2: What are your management priorities with this management?

Q3: Is this patient in shock? If so, how will you manage his circulation?

Q4: You decide that this patient requires definitive airway management. How will your airway management differ for a trauma patient compared to a standard adult RSI?

Q5: What is your approach to decompression of the chest? Will you begin with needle decompression, finger thoracostomy or immediately place a chest tube? Will you use a large-bore chest tube, a smaller bore chest tube or a pigtail catheter?

Q6: Does this patient require imaging of their neck vessels to rule out blunt cerebrovascular injury?

Denver criteria

Q7: Is there a role of tranexamic acid (TXA) administration here? If so, what dose and how will you administer it?

Q8: What blood work is necessary for this patient? Why?

Q9: How do you decide which patients require transfer to a trauma centre?

Q10: You determine this patient needs to be transported urgently to the regional trauma centre. What interventions will you consider performing prior to this transfer?

Awake Intubation

With George Kovacs

RESOURCES TO REVIEW PRIOR TO THE COURSE

Link to: [Dr. Kovacs book chapter on Awake Intubation](#)

Link to: [Airway Pitfalls](#)

Link to: [Obesity Emergency Management](#)

Even though we should always be prepared for a difficult airway with a plan A, plan B and plan C, when an airway is anticipated to be difficult from the start, consideration should be given to an awake intubation. In this module we will discuss the indications for awake intubation and demonstrate the procedural skills required to make it a success.

Case 1: The Anatomical Anticipated Challenging Airway

A 47 year old otherwise healthy man was extricated from a house fire. EMS estimates 35% total body skin burns. He arrives to your ED with normal vital signs except for a heart rate of 110, awake, and cooperative, with an oxygen saturation of 98% on 4L by nasal prongs. He is coughing and you note signs of singeing of his lips in addition to blistering burns to his forehead and neck. His voice is hoarse. His nares are covered in soot and his oral cavity appears diffusely red and swollen.

Q1: What factors will influence your decision making with regards to airway management in this patient?

Q2: What are the advantages of an awake intubation in this patient? Why not simply proceed with RSI if you feel intubation is indicated?

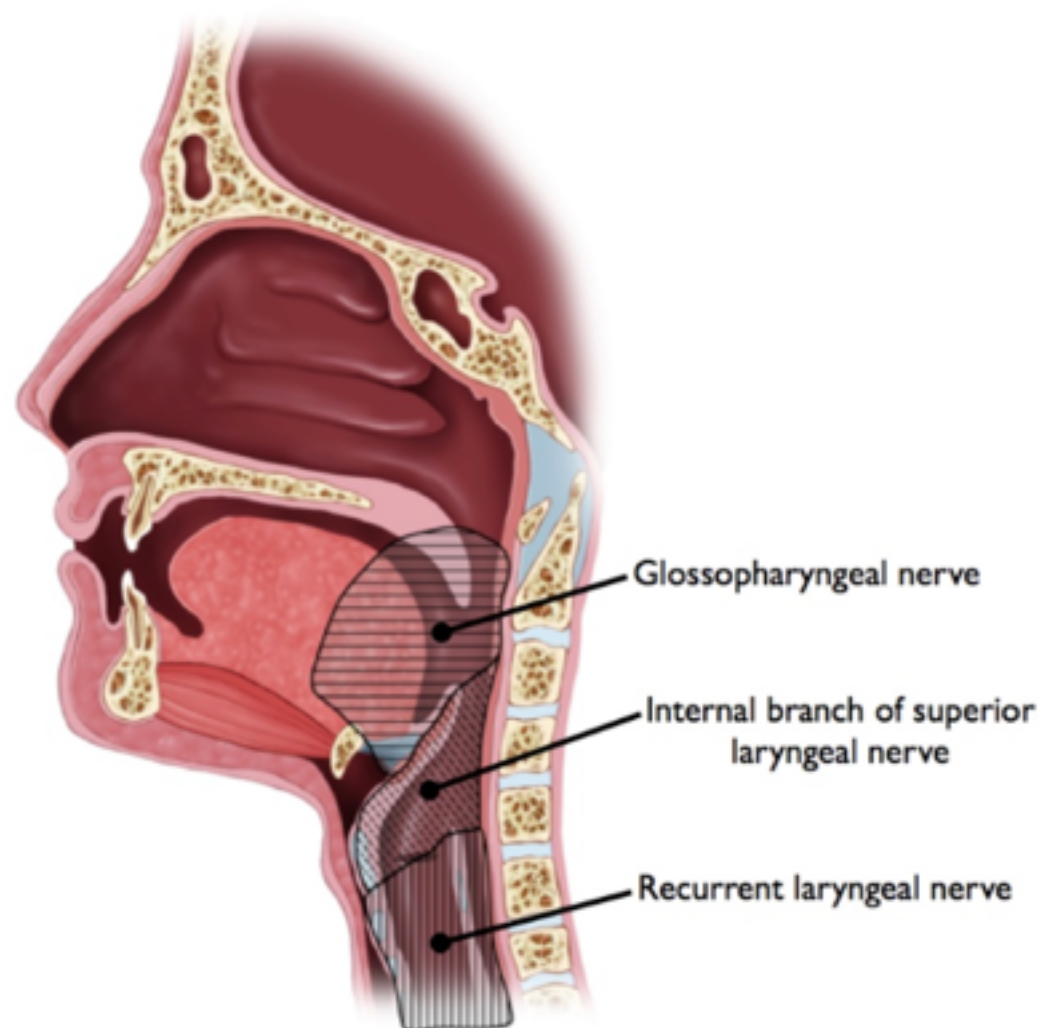
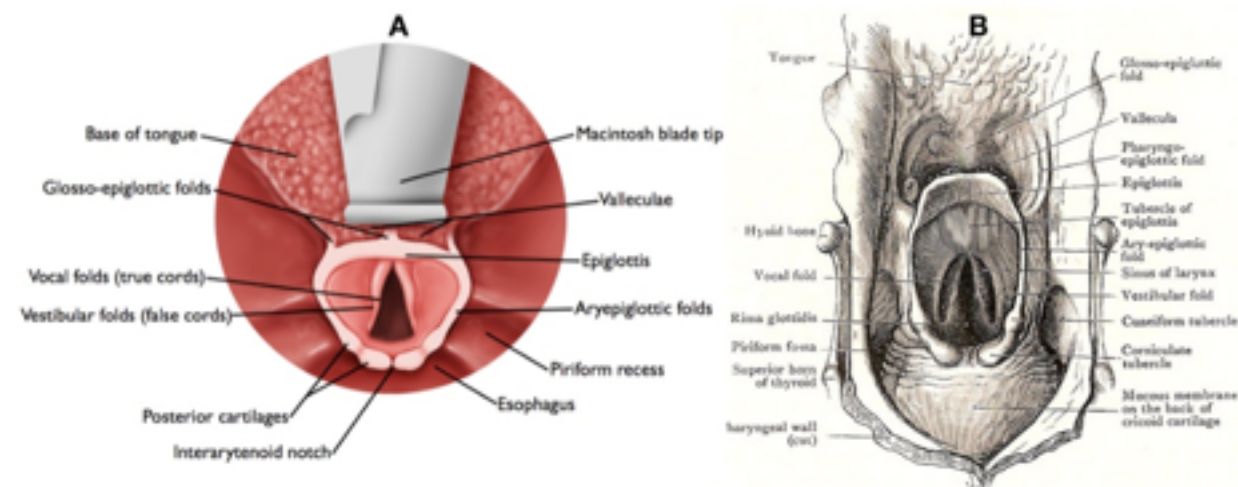
<i>Intubation Method</i>	<i>Advantages</i>	<i>Disadvantages</i>
Awake intubation	<ul style="list-style-type: none"> • Patient continues to: <ul style="list-style-type: none"> ◦ breathe spontaneously ◦ maintain, and... ◦ protect the airway • Avoids adverse effects of RSI induction agents; • Avoids risk of hypoxemia/hypercarbia during transition from spontaneous respirations to taking over positive pressure ventilation; • When anatomic landmarks are obscured, as with upper airway edema, tissue movement or bubbles on expiration may be only indication of the location of the glottic opening. 	<ul style="list-style-type: none"> • Clinician perception of patient discomfort; • Requires an element of patient cooperation; • As with RSI, requires training in indications, performing topical airway anesthesia and direct laryngoscopic or indirect flexible endoscope or videoscopic techniques.
RSI	<ul style="list-style-type: none"> • Skeletal muscle relaxation facilitates conditions for direct laryngoscopy; • Application of cricoid pressure may decrease risk of aspiration; • Not dependent on patient cooperation; • Drugs may help control undesirable physiologic responses, for example, ICP, HR; • High success rates in experienced hands.⁴ 	<ul style="list-style-type: none"> • RSI drugs may cause profound drop in blood pressure, for example, in shock states; • Not all emergency physicians are adequately trained in, or comfortable using RSI; • "Rescue RSI" not appropriate for all uncooperative patients, for example, those with obstructing airway pathology; • Succinylcholine will not always wear off in time to have a patient resume spontaneous ventilation before life-threatening hypoxemia occurs in "can't intubate, can't oxygenate" situations; • Fear of the "what if I can't intubate or ventilate?" • Requires intimate knowledge of all drugs and contraindications to technique.
Deep Sedation	<ul style="list-style-type: none"> • Perception of a sense of security: "I haven't 'burned any bridges' by giving a muscle relaxant..." • May help control an uncooperative patient; • May make the clinician feel more humane. 	<ul style="list-style-type: none"> • Often gives a false sense of security; • Retains many of the downsides of RSI while not delivering the upside of facilitated conditions; • Undesirable reflexes intact: <ul style="list-style-type: none"> ◦ gag/vomiting ◦ laryngospasm; • No guarantee that deep sedative doses will leave the patient breathing spontaneously or maintaining an airway; • Airway protection ablated in a full stomach patient, often with no applied cricoid pressure; • Deep sedative doses of medication can still hemodynamically "crash" the patient; • Compared with RSI, scientific literature clearly documents less optimal intubating conditions using only deep sedation.⁷⁶⁻⁷⁸
Awake tracheotomy or cricothyrotomy	<ul style="list-style-type: none"> • In the patient presenting with obstructing airway pathology, there's no risk of losing the airway during application of topical airway anesthesia or attempted tube passage from above. 	<ul style="list-style-type: none"> • Requires requisite surgical skills and equipment.

Q3: If you elect to proceed with awake intubation, what equipment will you require? If you do not have access to an atomizer device or flexible laryngoscope can you still proceed with the awake intubation?



Q4: During your awake intubation your patient becomes agitated and stops cooperating. How do you proceed?

Q5: If during the awake intubation you note significant swelling of the airway structures and are concerned your ET tube will not fit, how do you proceed?



Approach to Topicalizing the Airway

1. Apply nasal oxygen and have ready adjunctive procedure and post procedure sedation. Be prepared to take control of the airway having a complete array equipment and medications as you would for an RSI.
2. Engage and reassure the patient using lay terminology. Give them the suction to use as necessary and agree on hand signals defining that 'things are ok' and when to 'stop'.
3. Apply approximately 1 inch of the 5% lidocaine ointment to a tongue depressor and push it distally to create a lidocaine lollipop (Video 2 see link in legend).
4. Have the patient extrude their tongue and gently trap it anteriorly with a gauze.
5. Do not 'wipe' the ointment on the tongue, gently apply the lidocaine lollipop as posterior as possible moving side to side so that it 'melts' down the posterior slope of the tongue. It may take 2-3 passes to apply this initial application. (this may need to be repeated in some patients).
6. Using atomized 4% lidocaine, spray the tongue, tonsillar regions and posterior pharynx generously.
7. Reassure the patient explaining that they may cough during the next stage of spray and after they may feel slightly short of breath ('glottic dyspnea').
8. Trap the tongue. Bend the nozzle tip down to 70-90° and attack the posterior tongue and glottis ideally during inspiration. Do this a couple of times.
9. Perform 3 glottic/tracheal sprays either through the mouth with nozzle tip bent to 90° during inspiration. Alternatively, in a cooperative patient apply through a patent nares, again during a 'big' inspiration through the nose.
10. Use of Jackson forceps to place a lidocaine soaked pledgets held in the piriform recess on each side for up to 1 min (optional) (Video 1 see link in legend).
11. Perform gentle precision laryngoscopy or use a flexible intubating scope and put the damn scope in and tube the patient. You will know during laryngoscopy if your patient requires a second dose of lidocaine ointment.

Q6: You have successfully intubated your "awake" patient. How do you now proceed with post-intubation sedation and analgesia?

Case 2: The Physiologic Anticipated Challenging Airway

A 45 year old morbidly obese man arrives via EMS on a nonrebreather in severe respiratory distress following a febrile respiratory illness, with an oxygen saturation of 85%. EMS tells you that he improved when they initiated the nonrebreather up but that he seems to be tiring and his “sat” has dropped from 90%. His heart rate is 124, blood pressure is 98/57 and temperature 38.1. He is placed on BiPAP but the oxygen saturation remains at 85%.

Q1: How does obesity alter airway physiology and airway management?

Q2: What are the advantages of an awake intubation in this patient? Why not simply proceed with RSI if you feel intubation is indicated?

Q3: What steps will you go through for an awake intubation in this patient?

Pulmonary Embolism

With Kerstin DeWit & Maria Ivankovic

PODCAST TO LISTEN TO PRIOR TO THE COURSE

Link to: [PE Challenges in Diagnosis P1](#)

Link to: [PE Challenges in Diagnosis P2](#)

Link to: [Thrombolysis in PE video](#)

Link to: [PE Workup in Pregnancy](#)

Link to: [D-dimer in Pregnancy](#) (*min 16:15)

Link to: [POCUS Cases 1 - PE](#)

The range of clinical presentation of PE is vast, from mild shortness of breath on exertion to cardiac arrest. Many challenges in diagnosis, work-up and management persist despite great strides in research on PE in recent years...

Case 1: A bit SOB and fatigued...

A 38 year old otherwise healthy woman who works at a downtown law firm presents to your ED with a first ever crescendo onset of persistent, non-radiating right sided 6/10 CP that started while she was driving to work a few hours ago.

On deep inspiration the pain increases to 8/10 and she admits to feeling a little bit SOB – maybe and much more fatigued than usual. There are no other exacerbating or alleviating factors.

She has no cough, no fever, no presyncope, no nausea, no sweats, no leg swelling or pain, no recent immobilization. She's been on oral contraceptives for 20 years and smokes the occasional cigarette at social gatherings. Otherwise, no cardiovascular or thromboembolic risk factors.

On exam she appears well in no respiratory distress while texting her work colleagues. Her vital signs are all normal, chest is clear, there's no cardiac audible rub or murmur, no pulse deficit, no calf swelling or tenderness.

ECG shows normal sinus rhythm with an incomplete RBBB – there's no previous ECG to compare, and the nurse has already drawn routine blood work and troponin, which are all normal.

Q1. Would you order a D-dimer in this patient? How should we use (or not use) D-dimer in PE?

PegED study Dec 2019

<https://rebelem.com/peged-study-is-it-safe-to-adjust-the-d-dimer-threshold-for-clinical-probability/>

Q2. If this patient were pregnant, how would that change your work-up? What is the best way to work up PE in pregnancy in 2020?

Q3: This patient is taking clopidogrel for coronary disease and comes in with PE, how do you anticoagulate them?

Case Continued: CT comes back showing a single subsegmental PE

Q4: Would you treat this patient with full dose anticoagulants?

Case Continued: One week later the patient returns to your ED. She was not anticoagulated on her first visit. She is severely short of breath and complains of pleuritic chest pain. She has a respiratory rate of 36, satting 88% on a non rebreather, tachycardic at 145bpm with a BP of 95/65. Her ECG shows right axis deviation with signs of right heart strain. (We know this is unrealistic because subsegmental PEs are benign, but work with us on this anyhow)....

Q5: What are you treatment priorities for this patient? What are the most important actions in diagnosing and resuscitating the unstable PE patient?

Q6: Will you thrombolyse this patient without CT confirmation of PE? How should we define submassive or moderate risk PE and should we treat it any differently than a massive or high risk PE or stable low risk segmental PE?

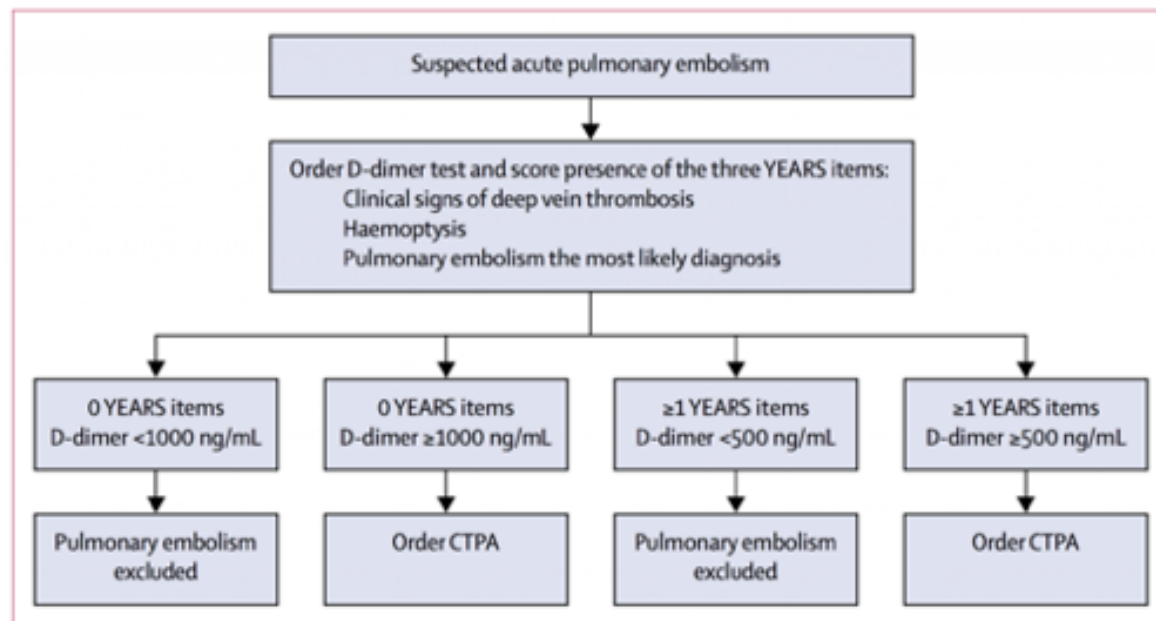


Figure 1: YEARS algorithm

CTPA=computed tomography pulmonary angiography.