Rap #11, 07/16 Regions RAP Summary (Intern Intro)

**Differential Diagnosis** (EMinS 6/5/16, Authored by Anna Pickens) - Reviewed by Jackie Kelly

- For every patient, consider multiple diagnoses.
  - Flipped classroom or basic EM textbook are good resources to use to create your list of possible diagnoses.
  - Organize your thoughts.

- Always consider:
  - What is common?
  - What can kill my patient (for each complaint)?

- Sort differential diagnoses into three columns:
  - Most likely
  - Need to rule out
  - Not as likely

- Need to rule out are the most important
  - These could cause significant morbidity or mortality

- Come up with a plan for how to address those items in the first 2 categories
- The third category are things you’ve thought about but don’t need to do any more workup to rule out
- Example: diabetic female with red leg and pain, no history of clots, no surgeries, non-smoker, no cardiac or renal history, good pulses but tender on exam
  - DDx: cellulitis--most likely, DVT--need to rule out, renal failure, CHF, arterial insufficiency
  - “I think the patient has cellulitis but I’d like to rule out DVT. I have low suspicion for arterial insufficiency or venous stasis as a cause of her presentation. I’d like to get a duplex ultrasound and then plan to send the patient home with antibiotics for cellulitis when the ultrasound is negative.”

**Evaluation**

- **Air Grade:**

<table>
<thead>
<tr>
<th>Tier 1: BEEM Reter Scale</th>
<th>Score-choose only 1</th>
<th>Tier 2: Content accuracy</th>
<th>Score-choose only 1</th>
<th>Tier 3: Educational Utility</th>
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<th>Tier 4: EBM</th>
<th>Score-choose only 1</th>
<th>Tier 5: Referenced</th>
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<td>Assuming that the results of this article are valid, how much does this article impact on EM clinical practice?</td>
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<td>100% sensitivity, 68.7% specificity to identify pt's needing nsg intervention</td>
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Does that condition require investigation (CanadiEM 5/10/16, Authored by Shahbaz Syed) - Reviewed by Matt Jones

- Minimal/Minor Head Injury
  - Minor: Loss of consciousness, definite amnesia or witnessed disorientation in pt’s w/ GCS 13-15.
  - Canadian Head CT Rule
  - 100% sensitivity, 68.7% specificity to identify pt’s needing nsg intervention
  - Increased Head CT’s ordered overall
  - CCHR applied to patients with minimal head injury or CCHR incorporated in physician gestalt

- Minimal head injury
  - Risk factors: persistent n/v, suspected abuse, szr, palpable depressed fx, anticoagulation/bleeding diasthesis, extremes of age with HA/N/V, extracranial injuries requiring admission
  - Without risk factors: 1.8% had intracranial finding, 0.4% needed nsg
  - With risks: 5% had findings, 0% needed nsg
  - Scandinavian guidelines

https://www.evernote.com/pub/joewalter9999/regionsrapoverviews?linked=d46f493a-23ad-42fc-8209-2934d574ac7f&newReg=false#st=p&n=968a49...
- Created to guide management in pt’s with minimal head injury
- Discharge without CT if:
  - GCS 15 w/out risk factors (LOC, vx2, anticoagulation, szr, depressed/basilar fx, focal findings
  - 0% of patients in validation study had findings on CT
- Anticoagulated patients
  - GET A CT

- Chest Pain: Does it require a CXR?
  - 2-6% of CXR’s have clinically significant pathology in chest pain patients
  - Validation study found pathology found in:
    - Older patients
    - Chest pain + SOB
    - Tachypneic
    - Concerning comorbidities
  - Clinical rule failed validation
    - Validation was done at Mayo
      - Sicker patient population with more comorbidities
      - Pulmonary edema/effusions were found more often
        - These are more of a clinical diagnosis.
        - POCUS better at finding edema/effusions
  - Bottom line: CXR should be ordered when there is a question a CXR might answer, not as a screening test.

- Syncope: Does it require investigation?
  - Head CT?
    - In a prospective, multicenter study, 3.4% of patients (1000+) had clinically important findings
      - These patients had:
        - Elevated INR
        - Low GCS
        - Head injury
    - Probably don’t get it unless abnormal neuro exam or significant trauma involved
      - ACEP recommendation
  - Overall the yield for syncope workup is low in a "low risk cohort"
  - Workup includes:
    - Labs: 4.5%
    - ECG: 4-6.7%
    - CXR: 0%
    - Holter: 1-16%
    - Troponin: 0.6-0.62%
  - "Low risk cohort" includes
    - Age <50
    - Vasovagal predisposition
    - No known cardiac disease
  - Number of clinical decision rules that all have issues
    - San Francisco
    - ROSE
    - StEPS
    - Boston
    - Anatolian
  - Canadian Syncope Risk Score
    - Newly developed decision rule
      - Vasovagal predisposition was not associated with serious adverse events
  - Bottom line: Well patient who syncopates and then appears well, get an ECG

- AFib: Does it require investigation?
  - Labs?
    - Prospective cohort study found that 0% of pt’s with recurrent afib requiring cardioversion had clinically significant findings
  - Troponin?
    - Retrospective chart review:
      - 13.7% had positive troponin
      - 4.9% treated as ACS
        - All patients treated as ACS had chest pain
  - US study:
    - 5.5% of patients admitted to rule out ACS ruled-in
100% of these had chest pain
100% had ST elevation or depression >2mm

- No chest pain? No ECG findings? Known paroxysmal afib?
  - Troponin likely unnecessary

- Bottom line:
  - Recurrent afib needing cardioversion
  - ECG pre and post cardioversion is all that is needed
  - No chest pain = no enzymes

Renal colic: Does it require investigation?

- Large retrospective chart review:
  - 256 patients
  - 74% getting CT
  - 38% normal CT
  - 58% had urolithiasis
  - 2% had urgent/emergent cause of symptoms identified
  - 79% of these pt's had 2+ CT's over 10 months

- Who should get imaging?
  - First presentation of suspected renal colic
  - Alternative dx found in 33.1% of these patients
    - 47% of which were clinically significant
    - 9% changed management
  - Reasonable to image those with diagnostic uncertainty or alternative diagnoses

- ACEP guideline
  - Avoid CT in otherwise healthy patients <50 with known history of kidney stones presenting with symptoms of uncomplicated renal colic
    - Complicated renal colic:
      - pyuria
      - Fever
      - Intractable pain
      - Solitary kidney
      - Abnormal creatinine
      - Past history of obstructive stone

- Bottom line:
  - Patients age < 50 with known hx of renal colic and uncomplicated presentation do not need CT.
  - US to risk stratify patients with hydronephrosis

Evaluation

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Your Score: 4 7 5 7 7

Undifferentiated Sick Infant (EMDocs 4/8/16, Authored by Tim Horeczko) - Reviewed by Allison Grace
• Combination of abnormalities upon visual/auditory assessment will help determine category of pathophysiology
  
  • **Appearance** – "TICLS"
    
    • Tone
    • Interactiveness
    • Consolability
    • Look/gaze
    • Speech (or cry)
  
  • **Breathing, work of**
    
    • Nasal flaring
    • Retractions
    • Grunting
    • Stridor
    • Positioning
  
  • **Circulation**
    
    • Pallor
    • Cyanosis
    • Mottling
  
  • **Sick Infant Differential "THE MISFITS"**
    
    • Trauma
    • Heart Disease or Hypovolemia
    • Endocrine
    • Metabolic
    • Inborn Errors of Metabolism
    • Seizures
    • Formula (dilute or too concentrated)
    • Intestinal disasters
      • Necrotizing enterocolitis, Hirschsprungs, Volvulus
    • Toxins
    • Sepsis
  
  • **Suspected Congenital Heart Disease**
    
    • Do the Hyperoxia Test
      • pO2 via ABG after supplemental oxygen
      • >250 – great, very unlikely CHD
      • 100-250 – judgement call
      • <100 – CHD until proven otherwise
    
    • If <4 wks give Prostaglandin E
      • 0.05 mcg/kg/min to "kEEEEp open ductus arteriosus" to allow some mixed venous blood to enter systemic circulation
  
  • **Evaluation**
Common errors during intubation (EMDocs 6/19/16, Authored by Joshua Bucher) - Reviewed by Jenny Bennett

- Preparing for a difficult airway
  - 12% of airways require multiple attempts
  - Reviewed common intubation complications and how to prevent these
  - 5 common errors
    - Error 1: Failure to evaluate the difficult airway
      - Difficult intubation assessment
        - LEMON
          - Look externally
          - Evaluate (3-3-2 rule)
          - Mallampati score
          - Obstruction
          - Neck mobility
        - Difficult BVM assessment
          - BOOTS
            - Beard
            - Old
            - Obese
            - Toothless
            - Snoring
        - Laryngeal handshake
  - Palpate anatomy needed for cric (hyoid, thyroid, cricoid and cricothyroid membrane)
  - If you predict a difficult airway then prepare for one
    - Bougie
    - Video laryngoscopy
    - LMA
    - Prep the neck
    - Also have your ventilation aids like oral and nasal airways, another person for two hand BVM, if that fails LMA or King to help ventilate
  - JW Editorial: Consider all emergent airways as potentially difficult airways and plan accordingly.
- **Error 2:** Failure of positioning the airway.
  - Position yourself and the patient
  - Ideal patient positioning is ear to sternal notch
    - "HELP" position
      - Head elevated laryngoscopy positioning
      - Elevate head with pillows or ramp up the bed in a more obese patient
      - Helps with visualization but also helps preoxygenate
  - Height of the stretcher close to but not above sternum of the intubator
  - Visualization through monocular focusing 12-18 inches away with your left arm flexed or fully extended
    - Left or right eye dominant
      - Right eye dominant
        - Look straight ahead
      - Left eye dominant
        - May need to tilt head to the right to get in line with cords
  - Avoid atlanto-occipital overextension as this will push back the epiglottis

- **Error 3:** Failure to prepare a backup plan.
  - Have all the extra pieces for backup available in all sizes
    - Nasal or oral airways
    - LMA
    - Supraglottic device to help ventilate
  - Often difficult airways have little time to prepare
    - When time is short more errors in judgement occur
  - Bougie
    - May help with a blind attempt
  - If still having trouble then may consider fiber optics or glidescope (or other hyperangulated blade)
  - If continued trouble get help
    - Anesthesia, surgical subspecialties
  - If CAN NOT oxygenate and ventilate then EMERGENT SURGICAL CRICOTHYROTOMY
    - Do not delay

- **Error 4:** Failure to select appropriate methods and medications
  - Technique is key
    - Insert the blade with handle pointing towards feet
    - Then once blade reaches the vallecular space the angle changes to 40 degree
      - Pointing towards the angle where the wall meets the ceiling
    - Caution to not cause trauma when inserting the blade
    - Angle and position will determine cord exposure, not force
    - When inserting the ETT or bougie use gentle, fluid motion
    - Pick the right size blade and ETT to avoid damaging structures
    - Choose the right medications for RSI
      - Ketamine or etomidate may be preferred in hemodynamically unstable
      - Consider push dose pressers for possible peri-intubation hypotension

- **Error 5:** Failure of decision making
  - Stepwise approach is needed for airway management
    - JW Editorial: This is ripe for a checklist or protocol... see discussion here
    - Example from EMCrit:
DENITRIFICATION:
- Denitrogenated ≥ 3 minutes
- ApOx with NC @15
- Oxygenated ≥ 95% (± CPAP)
- Look in Mouth · Dentures · Range Neck
- Positioning
- Pulse Ox Visible or Audible
- Access - Reliable & Tested

KITS:
- Kit Dump on Table
- BVM (± PEEP Valve) on Oxygen
- Waveform Capnograph on BVM
- Video Laryngoscope
- Backup Laryngoscope
- OPA, Bougie, SGA, Scalpel
- Suction x 2

EVALUATION:
- Don’t delay intubation
- “Can’t intubate, can’t ventilate”
  - Cricothyrotomy, this is not a failure it’s the necessary procedure
- Get help if you need it

EMGRIT.ORG
Complications of procedural sedation (R.E.B.E.L. EM 2/22/16, Authored by Salim Rezaie) - Reviewed by Brad Hansen

- Background
  - Procedural sedation and analgesia (PSA) is commonly done in the ED to help facilitate painful/stressful procedures.
  - This requires close monitoring and is not without potential adverse events.
  - There are numerous analgesic, sedative, and anesthetic agents that can be used.
  - The purpose of this systematic review and meta-analysis is to determine the incidence of adverse events during PSA in the ED, including the frequency of events with individual drugs and different drug combinations.


- What They Did
  - Systematic Review and Meta-Analysis to evaluate the incidence of adverse events in adults undergoing procedural sedation in the ED.
  - Included RCTs and Observational studies published after 2005.
  - Included randomized controlled trials and observational studies of adults (> 18 years).

- Outcomes
  - Estimated incidence per 1,000 patients with 95% CI for the following:
    - agitation, apnea, aspiration, bradycardia, bradypnea, hypotension, hypoxia, intubation, laryngospasm, and nausea/vomiting.

- Results
  - Systematic review/meta-analysis process
    - 2046 titles for review when searched
    - 55 articles, with 9,652 procedural sedations, were eligible for inclusion
    - 25 were RCTs
    - 30 were Observational studies

- Common Events:
  - Hypoxia: 40.2/1,000 sedations
    - O2 Sat < 90%: 23.0/1,000 sedations
    - O2 Sat <94%: 73.1/1,000 sedations
    - O2 Sat <95%: 230.7/1,000 sedations
  - Vomiting: 16.4/1,000 sedations
  - Hypotension: 15.2/1,000 sedations
  - Apnea: 12.4/1,000 sedations

- Severe Adverse Events Requiring Emergent Intervention:
  - Aspiration 1.2/1,000 sedations
  - Laryngospasm: 4.2/1,000 sedations
- Intubation: 1.6/1,000 sedations

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<tr>
<th>Adverse Event</th>
<th>Studies</th>
<th>Overall Incidence (Per 1,000 Sedations)</th>
<th>Meds with Highest Rate of Adverse Event</th>
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<tbody>
<tr>
<td>Agitation</td>
<td>38 Studies/6,631 Sedations</td>
<td>9.7 (95% CI 6.1 - 13.5)</td>
<td>Ketamine, Propofol</td>
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<td>Apnea</td>
<td>32 Studies/3264 Sedations</td>
<td>12.4 (95% CI 7.9 - 23.3)</td>
<td>Midazolam, Miotic, Opiate</td>
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<td>Aspiration</td>
<td>10 Studies/2,870 Sedations</td>
<td>1.8 (95% CI 0 - 2.6)</td>
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<td>Bradycardia</td>
<td>8 Studies/937 Sedations</td>
<td>6.8 (95% CI 1.1 - 11.5)</td>
<td>Ketamine, Propofol</td>
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<td>Hypotension</td>
<td>37 Studies/5,901 Sedations</td>
<td>16.2 (95% CI 10.7 - 19.7)</td>
<td>Propofol, Miotic, Opiate</td>
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<td>Hypoxia</td>
<td>12 Studies/7,116 Sedations</td>
<td>40.3 (95% CI 32.5 - 47.9)</td>
<td>Propofol, Miotic, Opiate</td>
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<td>Intubation</td>
<td>10 Studies/ 86,986 Sedations</td>
<td>1.6 (95% CI 0.3 - 2.9)</td>
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<td>Laryngospasm</td>
<td>5 Studies/993 Sedations</td>
<td>4.1 (95% CI 0 - 9.5)</td>
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<td>28 Studies/3,219 Sedations</td>
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<td>Ketamine</td>
</tr>
</tbody>
</table>

- **Sensitivity Analysis**
  - If observational studies excluded (Incidence of adverse events in PSA Significantly Higher in RCTs)
    - Agitation: 41.1 vs 9.8 per 1,000 sedations
    - Apnea: 21.5 vs 12.4 per 1,000 sedations
    - Hypoxia: 87.6 vs 40.2 per 1,000 sedations
    - Vomiting: 62.3 vs 16.4 per 1,000 sedations

- **Strengths:**
  - Searched 8 electronic databases.
  - Adhered to the Preferred Reporting Items for Systematic Reviews (PRISMA) Guidelines.
  - Used the Cochrane Collaboration bias appraisal tool to assess for bias in RCTs and the Newcastle Ottawa scale to assess for bias in cohort studies.
  - Tried contacting authors by email if data were missing or unclear.
  - Interobserver agreement of which studies to include had a kappa of 0.99 (95% CI = 0.98 – 1.0).

- **Limitations:**
  - May not apply to the pediatric population (excluded if <18 years).
  - Drugs received prior to OSA were not included as interventions, which could cause an increase in adverse events
    - Such as respiratory depression from opiates.
  - Some heterogeneity between the studies.
  - Different studies used different outcome levels but were grouped together in this study.
  - Variation in definitions for outcomes and lack of standardization in reporting of outcomes may impact the estimates of this study.
  - What intervention was needed after hypoxia, nausea, and hypotension were not reported in all the studies.
  - There were not enough events in some of the medication categories to determine if the risk of adverse events was higher with certain medications or combinations.

- **Discussion:**
  - This data can help in shared decision making to discuss the risks, benefits, and alternatives for PSA.
  - The routine use of capnography monitoring during PSA is recommended
    - Allows the detection of hypoventilation and apnea earlier than pulse oximetry and/or clinical assessment alone.
  - ACEP has established their evidence in adult PSA as:
    - Propofol – Level A recommendation
    - Etomidate and Combination Ketamine/Propofol – Level B recommendation
    - Ketamine Alone – Level C recommendation
  - Interestingly the incidence of adverse events with Ketofol was lower than when compared to each medication alone.
    - This should however be balanced with the complexities of mixing two medication together in one syringe, potentially adding steps and calculations leading to medication errors.
  - The authors of the paper have also created a pocket card, which they use at their institution based off the data from this paper to help with consent.
**Author Conclusion:** "Serious adverse events during procedural sedation like laryngospasm, aspiration, and intubation are exceedingly rare. Quantitative risk estimates are provided to facilitate shared decision-making, risk communication, and informed consent."

**Clinical Take Home Point:** The incidence of serious adverse events during procedural sedation and analgesia in the ED are rare, but shared decision making and informed consent should still be used as this is not a completely benign procedure.

**Evaluation**

- **Air Grade:**

<table>
<thead>
<tr>
<th>Tier 1: BEEM Rater Scale</th>
<th>Tier 2: Content accuracy</th>
<th>Tier 3: Educational Utility</th>
<th>Tier 4: EBM</th>
<th>Tier 5: Referenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assuming that the results of this article are valid, how much does this article impact on EM clinical practice?</td>
<td>Do you have any concerns about the accuracy of the data presented or conclusions of this article?</td>
<td>Are there useful educational pearls in this article for residents?</td>
<td>Is this article reflect evidence based medicine (EBM) and thus lack bias?</td>
<td>Are the authors and literature clearly cited?</td>
</tr>
<tr>
<td>Useless information</td>
<td>No concerns over inaccuracies</td>
<td>Low value: No valuable pearls</td>
<td>Not EBM based, only expert opinion (and thus more biased)</td>
<td>No</td>
</tr>
<tr>
<td>Not really interesting, not really new, changes nothing</td>
<td>Yes, many concerns from many inaccuracies</td>
<td></td>
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<tr>
<td>Interesting and new, but doesn’t change practice</td>
<td>Yes, a major concern about few inaccuracies</td>
<td>Yes, but there are only a few (1-2) valuable or multiple (&gt;3) less-valuable educational pearls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interesting and new, has the potential to change practice</td>
<td>Minimal concerns over minor inaccuracies</td>
<td>Yes, there are several (&gt;3) valuable educational pearls, or a few (1-2) KEY educational pearls that every resident should know before graduating</td>
<td>Mostly EBM based</td>
<td></td>
</tr>
<tr>
<td>New and Important: this would probably change practice for some EPs</td>
<td>No concerns over inaccuracies</td>
<td>Yes, there are multiple KEY educational pearls that residents should know before graduating</td>
<td>Yes exclusively EBM based (unbiased)</td>
<td></td>
</tr>
<tr>
<td>New and Important: this would change practice for most EPs</td>
<td></td>
<td></td>
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</tbody>
</table>

Your Score: 4 6 5 7 7

Edited by Brian Hahn, Matt Bogan and Joe Walter