Medical Myths: Cricoid Pressure

Minh Le Cong MD and Anand Swaminathan MD

- Cricoid pressure was first described by Dr. Sellick in the 1960s. It refers to applying pressure over the cricoid cartilage, generally with two fingers, such as the thumb/index finger or thumb/middle finger. This provides direct posterior pressure backward onto the cricoid cartilage. The premise is to push the cricoid cartilage against the esophagus to occlude it and prevent regurgitation of stomach contents into the upper airway. The initial papers were small, non-randomized case series with the author as the main researcher.

Le Cong. There are some studies that show that it can cause airway obstruction and does not reduce regurgitation. However, we haven’t been taught to do it properly or safely. If you do cricoid pressure on yourself, you will find that you will be unable to swallow at some point. It is a simple maneuver and you can remove it at any time. The data is not robust but there are some randomized controlled trials currently underway in Australia looking at this issue.

- Swaminathan.
  - There are a number of studies using MRI that show that in most people, the esophagus actually lies lateral to the cricoid cartilage. When cricoid pressure was applied under MRI, these studies found that the esophagus tends to be displaced laterally if it wasn’t already displaced. There is one study that refutes this. A study by Rice in 2009 found that cricoid pressure resulted in reduction of the diameter of the hypopharynx by 35%, and that the hypopharynx and cricoid ring moved together as a unit. This compression, and not displacement, of the esophagus was felt to decrease the risk of aspiration.
  - A study by Jim Tsung found that visualization with ultrasound shows that the esophagus is lateral to the airway in 60 percent of patients. Cricoid pressure led to displacement in all.

- Cricoid pressure does not do what we have been told it does. Also, it probably decreases the tone in the lower esophageal sphincter, which may increase regurgitation.

- Cricoid pressure decreases airway patency. There are multiple papers that show that cricoid pressure in intubated patients results in increased peak pressures. It may be more difficult to bag these patients.

- Cricoid pressure obscures your view of the airway. Cricoid pressure can cause the vocal cords to close.

- There is no study that shows cricoid pressure reduces aspiration. An observational, retrospective chart review done in Africa looked at 4,891 patients who underwent C-sections. Cricoid pressure was applied in 61% of patients, and 24 vomited during induction. There were 11 deaths that were attributed to aspiration, and 9 of these were in the group with cricoid pressure. However, this is not a randomized controlled trial.

- In summary, cricoid pressure doesn’t do what it is supposed to. It pushes the esophagus laterally. It relaxes the lower esophageal sphincter, which may make patients more likely to experience passive regurgitation. It makes ventilation and views of the airway more difficult. In 50 years, there is not a single, well-done, randomized, controlled trial showing benefit.

Le Cong. Sometimes you don’t need great evidence to say that something is a reasonable idea because of the principle that we are trying to do the best for our patients in minimizing the harm for the procedure. This is similar to manual in-line stabilization for intubation in trauma patients; there is very little evidence supporting it, but it is considered the standard of care.
Paper Chase 1: Cough in Kids
Sanjay Arora MD and Michael Menchine MD

- Placebo and agave nectar were equally effective in reducing night-time cough for kids, and both were more effective than no treatment.
- Cough associated with upper respiratory infection is a problem for children, mostly because it disturbs their sleep (and their parents’ sleep). There aren’t many proven therapies for cough. The use of over-the-counter cough medications, antihistamines, and antitussives is actively discouraged for children less than two years old due to safety concerns, such as risk of death and general lack of efficacy.
- Honey has been used for centuries as a home remedy to relieve cough and was recently studied in a randomized controlled trial. This study found honey to be superior to placebo in children with cough.
- However, we aren’t supposed to give honey to children under a year of age, due to concerns about infant botulism. Agave nectar is a sweet syrup that is not associated with botulism. The authors looked at whether pasteurized agave nectar would be useful in the relief of cough in children with upper respiratory infection.

Case

A 3-month-old girl with Tetralogy of Fallot is sent from cardiology clinic to the pediatric emergency room for a hypercyanotic spell refractory to knee-to-chest positioning in clinic. The patient was awake but distressed, crying and cyanotic with initial oxygen saturation of 56%. After conservative management fails, they report successful management using intranasal fentanyl (as an alternative to morphine), with improvement of saturations over next ten minutes to 78%.

Mizuho Files: Management of a Tet Spell with Intranasal Fentanyl
Daniel Tsze MD MPH, Mizuho Spangler DO

Background
- Tetralogy of Fallot (TOF) is the most common form of cyanotic congenital heart disease and is made up of four components:
  - Overriding aorta
  - Pulmonary valve stenosis
  - Ventricular septal defect (VSD)
  - Right ventricular hypertrophy
• Patients with uncorrected TOF are at risk of hypercyanotic “Tet” spells, which are acute episodes of hypoxia and cyanosis caused by right-to-left shunting across the VSD. Patients will present with irritability, agitation, grunting, crying, and central cyanosis.

• During hypercyanotic spells, increased pulmonary outflow obstruction and/or decreased systemic vascular resistance lead to right-to-left shunting, causing hypercarbia and hypoxemia (which increases pulmonary vascular resistance). This can establish a cycle of right-to-left shunting, hyperpnea, right outflow tract obstruction and increased systemic venous return. Older patients may compensate by squatting, which decreases the right-to-left shunting, by decreasing venous return and increasing systemic vascular resistance (SVR). These spells can lead to serious complications, including syncope, seizures, and death.

• Management of hypercyanotic spells is targeted at decreasing right-to-left shunting by increasing SVR and decreasing hyperpnea.
  - **Step 1. Knee-to-chest position and supplemental oxygen.** Avoid IV starts (and any uncomfortable procedures) if possible, as agitation contributes to the problem. This knee-to-chest position increases SVR. Dr. Tze recommends doing this in the mother’s arms. Ideally, the baby will be lifted up on mom’s shoulder, with knees tucked up underneath his chest.
  - **Step 2. Morphine Sulfate 0.1-0.2 mg/kg IM or SubQ,** with goal of reducing ventilatory drive and systemic venous return.
  - **Step 3. Phenylephrine 0.2 mg/kg IV** to increase SVR and/or IV propranolol to manage muscle spasm causing right-sided ventricular outflow obstruction. Involve consultants at this stage of management, including cardiology and pediatric surgery.
  - **Step 4. General anesthesia.**

* Editors note: IV fluids (bolus of 10-20cc/kg) may be used to increase preload and optimize right ventricular end-diastolic volume, prior to initiation of Step 3 medications.

**What was the management in this case?**
- Initially: music, toys, turning lights down, keeping the child in mother’s arms with repetition of the knee-to-chest position
- After failure of initial measures, pharmacologic management was pursued, with intranasal (IN) fentanyl.

**What is the reason for intranasal administration?**
- **Nose-Brain Pathway** (“highway from the nose, straight to the brain”): This pathway is composed of olfactory and trigeminal nerves, which are exposed in the nasal cavity and circumvents the blood-brain barrier. This delivery method gets higher levels in the CNS faster than systemic administration.
- IN administration is better tolerated, as does not require a needle stick that is needed with traditional management with morphine.

**What is the dosing for intranasal administration of fentanyl?**
- Literature gives 1.5-2mcg/kg range (in this case, 2mcg/kg was given).

**How is intranasal fentanyl administered?**
- Using a mucosal atomization device (MAD). This device is a plastic attachment that is placed on top of a 1ml syringe that atomizes the medication and increases the absorption.
- The dose is divided between the two nostrils to increase the surface area.
- The medication is delivered to the mucosal surface and no inhalation is needed.

**What was the response to IN fentanyl?**
- In this case, onset of medication showed improvement of vitals within 10 minutes.

**Any plan for a study on IN fentanyl for hypercyanotic spells?**
- This is unlikely given early repairs and reduced frequency of patients presenting with hypercyanotic spells.
- This study may be possible in other environments or countries where repair is not done as early.

**Paper Chase 2:**
**Prothrombin Complex Concentrate (PCC)**
**Sanjay Arora MD and Michael Menchine MD**

- Patients with intracranial hemorrhage who were receiving warfarin therapy and received 4-factor prothrombin complex concentrate (PCC) had significantly faster INR reversal times than patients who received fresh frozen plasma (FFP). They also looked at the time until the patient was taken to the OR, and it was shorter in the PCC group. Patients were not followed for long-term morbidity or mortality or delayed thrombotic events.
- People fall down and hit their heads. Patients with intracranial hemorrhage who are on warfarin have a 50% higher 30-day mortality than their counterparts who are not anticoagulated.
- In 2012, the American College of Chest Physicians updated their consensus statement and said that if someone comes in with a life-threatening bleed, we should give them PCC rather than vitamin K, FFP, and potentially activated Factor 7. At the time, we did not have an FDA-approved PCC but this changed in April 2013 when the FDA approved Kcentra.
- Kcentra contains all four factors that warfarin normally reverses (II, VII, IX and X). It is the same as Beriplex or Octaplex, which
The Written Summary of the EM:RAP Monthly Audio Program

is available in other countries. Kcentra is now available in the United States.

- **Why is PCC superior to FFP?** It is a small amount of fluid administered, which is good because many of these patients are elderly with poor cardiac function or CHF. It works faster. It has more complete and longer acting reversal. It doesn’t need to be thawed. It is a single dose. There is no risk of infection. It reduces INR quickly.

- **Is there an increased risk of thrombotic events?** There is not much evidence for thrombotic events in the literature. There is some data describing thrombotic events with the use of PCC, but there is a lot of worldwide clinical experience that says that it is effective and safe.

- **The authors of this paper conducted a prospective observational study from April to December of 2013, looking at patients with intracranial hemorrhage who needed to get emergent reversal of their warfarin.** Some received operative treatment and some were non-operative. There was no specific study protocol. Treatment with PCC was given at the discretion of the treating physician.

- They enrolled 33 patients with intracranial hemorrhage and supratherapeutic INR that needed reversal. Of the 33 patients, 28 received FFP and only 5 received PCC. These were not large numbers. The initial INR in both groups was similar: about 3.

- **Time to reversal** (i.e. time to an INR <1.6) was 256 minutes in the FFP group versus 65 minutes in the PCC group. Time to the operating room was 307 minutes in FFP group versus 159 minutes in the PCC group. Patients were able to go to the operating room several hours faster in the PCC group.

- **Patients were not followed long enough to look for long-term outcomes, like overall mortality, development of clots, etc.** However, there have been several other studies looking at long-term endpoints.

- The trial that led to FDA approval was a multicenter trial with about 200 patients randomized to FFP (109 patients) or PCC (103 patients). The INR was corrected to less than 1.3 in 62% of the PCC group versus only 10% in FFP group, at 30 minutes. Adverse events, mortality, and thrombosis were similar in the two groups.


- **A before-after retrospective cohort study in 2013, comparing anticoagulation reversal with FFP vs PCC, found faster reversal, less need for packed red blood cell transfusion, similar hospital length of stay, no evidence of deep venous thrombosis or pulmonary embolism, and less overall badness including death.**


- **PCC wears off in about a day.** It is not a blood substitute and patients still need vitamin K. It is expensive and there has not been any robust cost analysis to see if it decreases time spent in the ICU.

- **PCC is now recommended as a first-line therapy, so we need to know about it and become familiar with the numbers.**

- A study from 2014 found that following a rapid reversal guideline, using vitamin K and PCC, decreased overall mortality by twofold and mortality due to intracranial hemorrhage by threefold, if reversal was initiated within 8 hours.


- In a study published in 2014, reaching target INR in patients with significant bleeding, who were given PCC and vitamin K, was associated with a 3.8x decrease in mortality.


Notes from the Community:
Soft Tissue Infection Review
Rob Orman MD interviews Brian Hayes PharmD

- **Which patients with uncomplicated cellulitis are at higher risk for treatment failure?**

- A prospective observational study of 600 patients found five risk factors for treatment failure: fever (T>38°C) at triage (odds ratio [OR] 4.3), chronic leg ulcers (OR 2.5), chronic edema or lymphedema (OR 2.5), prior cellulitis in the same area (OR 2.1), and cellulitis at a wound site (OR 1.9). Patients with multiple risk factors were at even higher risk.

- This paper informs our thinking about who may require hospitalization and intravenous antibiotic therapy for cellulitis.

- **Peterson D, et al. Predictors of Failure of Empiric Outpatient Antibiotic Therapy in Emergency Department Patients With Uncomplicated Cellulitis.** [PMID: 24845031]

- **Is there any benefit to giving two doses, twice daily, of double strength trimethoprim-sulfamethoxazole (TMP/SMX) for the treatment of methicillin-resistant Staphylococcus aureus (MRSA)?** No.
A prospective, observational study of patients with skin infections who were treated with either high dose TMP/SMX (2 DS tabs = 320 mg/1600 mg tablets twice daily) or standard dose (1 DS tab = 160 mg/800 mg twice daily) found that higher dosing conferred no advantage in clinical resolution.


Is there benefit in adding TMP/SMX to cephalexin when treating uncomplicated cellulitis? Probably not.


One hundred fifty patients with uncomplicated cellulitis were randomized to receive either cephalexin alone or cephalexin plus TMP/SMX. No difference was found in the clinical cure rate between the groups.

This study was criticized for not being widely applicable, due to its inclusion and exclusion criteria. Study inclusion criteria consisted of recent onset of soft tissue erythema associated with at least two of the following: pain, swelling, warmth, fever, lymphangitis, induration, or ulceration. Patients were excluded if they were already on oral antibiotics, were diabetic, immunocompromised, had peripheral vascular disease complicating the cellulitis, renal insufficiency, cellulitis in the area of an indwelling catheter, or were on certain medications such as warfarin or methotrexate.

For cases of uncomplicated cellulitis, we may not need to cover for MRSA. Strep is the most likely source of infection.

Clindamycin dosing: why is the IV dose so much higher than the oral dose?

Clindamycin is highly bioavailable orally (90%), but the recommended intravenous dose is 900 mg versus 150-450 mg for the oral route. Hayes and Orman were both stumped by the disparity in dosing recommendations for clindamycin for the two routes of administration, and there does not appear to be a good explanation for the discrepancy. Hayes recommends 300 mg four times daily, but there is no evidence supporting this as the optimal dose.

2014 Skin and soft tissue infection guideline


Impetigo

- What is appropriate for the evaluation and treatment of impetigo and ecthyma?
- Cultures: If there is purulence, the guideline recommends performing a gram stain and culture to identify whether the infection is due to staph or strep.
- Treatment: Topical mupirocin twice daily for 5 days or oral antibiotics for 7 days, with coverage for methicillin-sensitive Staph aureus (MSSA) and Strep species (cephalexin or dicloxacillin in most cases). If methicillin-resistant Staph aureus (MRSA) is suspected or confirmed, treatment options include doxycycline or TMP/SMX, although these agents do not have robust coverage for skin Strep species and additional coverage for Strep with cephaloxin may be needed. Clindamycin can also be used for both Strep and MRSA coverage, however MRSA resistance to this drug has risen dramatically in recent years and clindamycin should no longer be considered first-line coverage for MRSA.

Purulent infections

- What is the appropriate evaluation and treatment for purulent skin and soft tissue infections (abscesses, furuncles, carbuncles, and inflamed epidermoid cysts)? Although the guideline recommends gram stain and culture of purulent fluid from abscesses and carbuncles, it states that "treatment without these studies is reasonable in typical cases." This generates confusion regarding the purpose and necessity of the wound culture.
- Mild purulent infection
  - Treat with I&D alone. Hayes acknowledges that mild cases with surrounding cellulitis may warrant antibiotics.
- Moderate purulent infection
  - Treat with I&D and either empiric antibiotics (doxycycline or sulfamethoxazole-trimethoprim) or defined antibiotics (sulfamethoxazole-trimethoprim for MRSA or cephalexin or dicloxacillin for MSSA). Gram stain and culture are recommended for moderate infections. Clindamycin is no longer recommended for these infections.
- Severe infections: defined as lack of improvement despite prior incision and drainage (I&D) and antibiotics or those with an acute infection and presence of fever, tachycardia, tachypnea, abnormal WBC’s, or immunocompromised state.
  - Treat with I&D, wound culture, and intravenous antibiotics. Empiric antibiotics or those for confirmed MRSA include: vancomycin, daptomycin, linezolid, telavancin, and ceftaroline. Antibiotic choices for MSSA include: cefazolin, clindamycin, and nafcillin.

Anti-inflammatories

- Should anti-inflammatory agents be used to complement anti-
**Recurrent cellulitis**

The guidelines state that systemic corticosteroids (e.g., prednisone 40 mg daily for 7 days) could be considered in non-diabetic adults with cellulitis. Three studies have shown more rapid improvement in patients who received steroids versus those who did not. An RCT of 100 patients, who were treated with either 8 days of steroids plus antibiotics or antibiotics alone, showed a faster resolution of cellulitis with steroids. The benefit was greatest for those with leg cellulitis. There was no difference in relapse or recurrence between the two groups.


**Devil’s Advocate:**

**End-Tidal CO₂ Capnography in Deep Sedation**

Scott Weingart MD

- A Paper Chase segment in the November 2014 EMRAP discussed an article on the use of capnography during deep sedation with propofol. This was non-blinded, randomized controlled trial of almost 500 patients, who were young healthy women receiving a procedure with propofol sedation in a gynecology clinic. The authors were unable to confirm an additive role for end-tidal CO₂ monitoring in these cases performed by non-anesthesiologists. This was consistent with a recent ACEP policy statement saying that we don’t have to use end-tidal CO₂ non-anesthesiologists. This was consistent with a recent ACEP policy statement saying that we don’t have to use end-tidal CO₂ monitoring for the management of intubated patients. This justification for this comes from the Fourth National Audit Project from the UK.

- Most Emergency Departments should have waveform end-tidal CO₂ monitoring because it is the proper care for the management of intubated patients. This justification for this comes from the Fourth National Audit Project from the UK.

- How should you manage your procedural sedation when you are using agents designed for deep sedation? We need to stop kidding ourselves. What we do in Emergency Medicine is induce a brief state of general anesthesia for procedures like hip reduction, shoulder reductions, and cardioversion. We aren’t allowed to say it because the anesthesiologists get upset but this is what we are doing. You don’t want patients having their hips reduced to be responsive to pain and resisting you; you want them fully unresponsive to pain.

- Two questions come to mind. Should you be using supplemental oxygen? Should you be monitoring with end-tidal CO₂? These questions are linked. The Paper Chase segment discussed that end-tidal CO₂ monitoring is unnecessary based on this article. This may be true if you are not using supplemental oxygen.

- When we are breathing 21% oxygen (room air), the pulse ox will very quickly reflect any decrease in alveolar ventilation within seconds. If you stop breathing or decrease the efficiency of respiration, the pulse ox will drop from 100 to 98% or 95%, with very close correlation to end-tidal CO₂. This is because oxygenation is tied to ventilation when breathing room air. You can’t hold your breath for any prolonged period of time without starting to desaturate. However, with preoxygenation or supplemental oxygenation, the pulse ox will take a long time to drop despite the complete absence of ventilation. For these patients, it is clearly established that end-tidal CO₂ will demonstrate this long before there is a change in the pulse ox.

- Weingart likes having a buffer of oxygen and knowing that his patient could be apneic for 4-8 minutes before the pulse ox will change. He uses agents like propofol, methohexital, or etomidate, and they are likely to resume respirations before the pulse ox will change. If you are using preoxygenation for these patients, wouldn’t it be nice to know that they are apneic? If the patient is apneic, he stimulates the patient, or provides a jaw thrust, or pushes on the point located behind the ear lobe (this triple point allows you to give a jaw thrust, open the airway, provide painful stimuli, and blunt laryngospasm). If the patient takes a breath, it resets the clock and you have further safe apnea time, prior to a drop in the pulse ox. This is the benefit of end-tidal CO₂ monitoring: if you use supplemental oxygenation, you need to know when your patient becomes apneic. Not because there will be negative outcomes, but because it is a useful piece of information to have.


- In the study, the patients had fasted and were randomized to end-tidal CO₂ versus standard monitoring for a gynecologic procedure. These patients were not given supplemental oxygen.


- If you have this available in your Emergency Department, the cost is negligible and just the cost of a nasal cannula. You can jerry-rig this, if you don’t want to pay this minimal cost. It takes a short amount of time to set up (about 15 seconds). Blood pressure monitoring is much less useful. If your patients demonstrate a strong waveform on the pulse ox, their blood pressure is more than enough to perfuse them neurologically during their procedure. Weingart doesn’t pay attention to the number. He looks for whether or not the patient is generating exhaled end-tidal CO₂.

- This is essentially free. It is easy to do. It is the standard of care in the operating room for any procedural sedation. If you have end-tidal CO₂ monitoring available in your Emergency Department, put the patient on high-flow oxygen and monitor the end-tidal CO₂. If the patient is not receiving oxygen, you probably don’t need it. If there is any change in the pulse oximetry, you can briefly attempt stimulation, but you better be prepared to bag them.

- End-tidal CO₂ has not been shown to improve outcomes, but that doesn’t mean it isn’t beneficial.

- End-tidal CO₂ monitors exhaled carbon dioxide. It is a marker of ventilation. If you sedate a patient and he/she starts to hypoventilate, the CO₂ will rise. If you make the patient apneic, the end-tidal CO₂ will drop to zero. It tells you if the patient is oversedated. Pulse oximetry is less helpful because patients can maintain oxygenation for a prolonged period of time, despite hypoventilation or apnea, especially if the patient is on supplemental oxygen. If you are busy doing a procedure, you might not be able to appreciate apnea or hypoventilation, and CO₂ monitoring can help.

**Paper Chase 3: Antiemetic Cage Match!**

_Sanjay Arora MD and Michael Menchine MD_


- Ondansetron, metoclopramide, and placebo have equally good ability to drop discomfort associated with nausea in Emergency Department patients.

- Most of what we know about the efficacy of nausea medications is extrapolated from oncologic or post-operative trials. There have been about four trials of antiemetics in undifferentiated Emergency Department patients. These four trials generally show improvement in nausea scores, regardless of which agent is used. Most of the trials don’t have a placebo but rather compare two medications.

- There are two trials that used a placebo, in addition to a variety of antiemetics, and both showed that antiemetics had little effect beyond the placebo. However, most of these trials have been small.

- In this study, patients were eligible if they were over 18 years and the Emergency Department provider recommended IV antiemetics. It was a very broad catchment. Exclusion criteria included highly unstable patients and patients who had a contraindication to one of the study medications. Patients were also excluded if they had already received a dose of antiemetics or IV fluid hydration in the Emergency Department. Patients were randomized to ondansetron, metoclopramide, or saline. If patients needed a rescue dose, they were given ondansetron.

- The primary outcome was change in nausea severity, as measured on a visual analog scale before and 30 minutes after administration of medication. This scale has been validated in other studies and a change of 20mm is considered clinically meaningful. Secondary outcomes were self-reported improvement, need for rescue medications, etc.

- 270 patients were enrolled and the average visual analog score was 50. The most common reasons for nausea were recent opioid administration or gastroenteritis. After treatment, the VAS dropped by 27mm for ondansetron, 28mm for metoclopramide, and 23mm for saline (the placebo). These drops were clinically significant. None were clinically or statistically different from the others.

- 55% of patients were satisfied. Rescue medications were given to 35% in the ondansetron group, 36% in the placebo group and less frequently in the metoclopramide group (18%). There was no difference statistically.

- This a negative study. Other studies have demonstrated that antiemetics and placebo have large clinically significant reductions in nausea within 30 minutes, but none appears to be superior to others. One explanation may be that the other therapies, such as IV fluid hydration and pain medication administered to these patients, improved nausea. More work needs to be done before we say that antiemetics don’t work, but our supposition that they are as effective as previously thought is probably not true.

- It is unclear if effectiveness of antiemetics varies depending on the cause of the nausea. It may be that nausea associated with morphine resolves spontaneously within 20 to 30 minutes and the reflexive administration of antiemetics is unnecessary. Antiemetics have been shown effective in cancer patients. We should probably look more closely at which groups benefit the most from antiemetics.
The LIN Session:
How I Work Smarter
Michelle Lin MD

- Lin created a weekly “How I Work Smarter” series posted every Sunday on the Academic Life in EM, similar to the “How We Work” series on the Lifehacker website. This attempts to capture how productive educators and clinicians get stuff done.

- So much is taught about digital resources and content, but it is unmanageable if you don’t have a good filtering organizational and processing system in place. One of the main themes that have emerged from the series is email management.

- The tips revolve around two concepts. One involves a landmark book called “Getting Things Done” by David Allen and reaching a phenomenon called “inbox zero.” This concept was made popular by Merlin Mann. The premise is that you should only touch your email once and make a decision about each message. The options are to trash it, respond to it if it will take less than two minutes, delegate it, or triage it into one of several pending folders. These folders provide more of a time framework.

- You can create folders that say, “I need to do today,” “I need to do soon,” and “I need to do one day if I ever have free time.” Once you’ve tagged the emails, you can archive it, which works well in the Gmail platform. This takes your email out of your inbox and directly into an actionable task bin. You need to retrain your habits to routinely review your folders so that you can complete your tasks on time.

- If you are a skeptic, you might say that you can already do this with the use of stars, labels, tags, the read and unread button on the inbox, etc. However, this adds unnecessary cognitive load to your brain. According to the cognitive load theory of learning, information processing and learning retention is a limited phenomenon. You only have a limited cognitive load capacity and by constantly keeping the back of your mind busy, it distracts you from being really present and engaged in the day’s tasks.

- As Ryan Radecki says, “Run your email like you are running the department: disposition focused.”

- The framework of ED crowding is a three-pronged process: input, throughput, and output. This is applicable to your inbox.

- The input is receiving emails into your inbox: unsubscribe from as many sites as possible to reduce that input.

- In terms of throughput, only read emails once, and only do it when you can triage it using the “inbox zero” approach of: delete, respond, delegate, or file.

- Other suggestions.

- Lin uses Activeinbox, which integrates with the Gmail platform and allows her to assign dates and notes to emails that she is waiting for a response on and needs to address at a later date. However, this is not a free application.

- Anand Swaminathan assigns dates and tasks to emails by emailing the task to the Google Calendar. This is free.

- Salim Rezaie recommends color-coded calendars.

- Nathalie May sets up her Google Calendar with daily push notifications so she knows what is ahead of her for the day.

- Matt Dawson answers emails every time he goes to the bathroom.

- Victoria Brazil recommends the use of tags in Gmail to provide an easy visual alert of high priority items.

- Text expanders allow you to insert customized stock text with a unique set of keystrokes. If Lin types ‘eee’, it is converted into her work email address and ‘ppp’ types out her cellphone number.

- Learn the keyboard shortcuts.

- Be time-focused when working on projects. Work will expand to fill the available time. The Pomodoro Technique is a time management method that involves working in focused, timed bursts (pomodoros) lasting 25 minutes each. Between each 25 minute period, you get a five minute break. Track how many pomodoros you can complete in a day. This works well for many of us in Emergency Medicine since we focus well under pressure.

- Damian Roland recommends turning off all email notifications when trying to complete a project or task.

- Amal Mattu says, “If something needs to be done by deadline, I write down the deadline and just do it. If something doesn’t need to be done right away, I don’t do it right away.”

- Project management. Get familiar with cloud-based systems. You want all of your content synced in real time no matter which computer you are on and where you are. Some options include Google Drive, Dropbox, and Mendeley (which is a free online reference and PDF manager).

- Take care of big tasks early in the day when you are at your best.

- Teresa Chan talks about the theory of multiple wins or finding multiple purposes for the work you have put into a project: the time spent researching the background for a research project can be used for a lecture or a review blog post. Find several uses for the same project.

- Top ten inspirational and useful life tips.

  1. “Give yourself permission to have time to do nothing at all, and sleep does not count.” You need to have work time and play time. Mike Bond.

  2. “Help other people and focus on growing their careers.” Mentorship can be fulfilling for all parties involved. Rob Rogers.
3. Don’t be afraid of saying, “No.”
4. “Don’t be afraid to blaze your own trail.” Scott Weingart.
5. “Early is on time, on time is late, and late is unacceptable.” Lauren Westafer.
6. “Be skeptical, critical thinkers. Knowing the evidence can improve our practice and help set unrealisitic expectations. It’s about choosing wisely, which usually means choosing fewer tests and not more. Be skeptical, choose wisely, care deeply.” Ken Milne.
7. “The danger for most of us is not that our aim is too high and we miss it, but that it is too low and we reach it.” Salim Rezaie.
8. “If you’ve read something that has touched you or made a difference to what you do, have you let the person who wrote it know?” Damian Roland.
9. “Choose projects, jobs, and talks based on who is involved. Mates should always take precedence over prestige.” Victoria Brazil.
10. “Don’t be afraid to fail.” Mike Mallin.

Paper Chase 4:
Atrial Fibrillation
Sanjay Arora MD and Michael Menchine MD


- In a stable patient with atrial fibrillation or flutter, it is probably wise to wait a few minutes before treating their heart rate to make sure they don’t have some other underlying illness that is driving their tachycardia. If you treat patients, who are septic or have other underlying illness, with a beta-blocker or calcium channel blocker as soon as they walk in the door, the rate of adverse events from these medications goes from 7% to 40%, compared to those without acute medical illness.

- Most of the trials examining rate and rhythm control have excluded patients with another potentially serious complicating medical condition. In the paper, patients with atrial fibrillation/flutter and some other acute medical illness were referred to as “complex patients.” A classic example is a septict patient who presents with tachycardia and hypotension and is in atrial fibrillation. The authors looked retrospectively to see if we did more harm than good when we tried to treat the rate or the rhythm. There were no guidelines dictating physician treatment. The study was performed in Canada, which tends to utilize electric cardioversion more than in the US.

- The study was a retrospective chart review that was performed well. They followed the Gilbert guidelines; for example, all of the data extractors were blinded to the study hypothesis.

- How did they determine “complex patients” by looking at the chart? Two physicians reviewed the medical record to determine if there was an alternate acute diagnosis at the same time the patient was seen in the Emergency Department with atrial fibrillation or flutter. They had to identify a complex condition and specify the condition. If there was any inconsistency between the two physicians, a second pair of blinded physicians reviewed the chart. They looked for conditions such as sepsis, pneumonia, pulmonary embolism, gastrointestinal bleed, and drug overdose.

- The primary outcome was safety, as measured by predetermined adverse events. Major adverse events included need for pressors, intubation, stroke, bradycardia that required pacing or medical management, and death. Minor adverse events included need for fluids, oxygen via nasal cannula, etc.

- To make sure the groups were not fundamentally different in terms of degree of illness, they performed different analyses looking for confounding. They used propensity scoring adjustments to determine the risk of an adverse event with variables such as the individual physician, whether or not the patient arrived during solo physician coverage, age, sex, initial vital signs, rhythm, etc.

- During the yearlong period, they saw 1,112 patients with atrial fibrillation or flutter. They identified that 37.5% of these patients also had an acute medical illness. Over a third of patients had another medical diagnosis. Of the complex patients, 105 received rate control, 15 were cardioverted, and 15 received chemical cardioversion. 281 received treatment for their underlying medical condition but did not receive rate or rhythm control. Patient groups were similar in terms of heart rate, blood pressure, etc.

- 40% of patients who received rate control had an adverse event, and 43% of patients with rhythm control (either electrical cardioversion or chemical cardioversion) had an adverse event. Only 7% of the patients who received treatment for their underlying medical conditions, without rate or rhythm control, had an adverse event.

- What were the underlying medical conditions? Most had sepsis or congestive heart failure.

- Most of the adverse events were minor: IV fluids, oxygen supplementation, etc. However, 7.5% in the intervention group were intubated compared to 0% in the group without rate/rhythm control. 6% needed pressors compared to 1%. 1% needed CPR compared to 0%. No one died.

- They also looked at time to rate or rhythm control and found that if you waited, the adverse rate went down.

- This seems to be a situation where you should follow the dogma of “Don’t just do something, just stand there.”
These were relatively stable patients. You are better off taking the time to make sure there isn’t another condition contributing to their tachycardia rather than just giving a beta-blocker or calcium channel blocker for atrial fibrillation with a rate of 140.

**Doc in the Bay: EMTALA**

**Howie Mell MD**

- The Emergency Medicine Treatment and Labor Act practically defines Emergency Medicine. We know it well. However, there are some nuances that warrant discussion when it comes to Emergency Medical Services (EMS).
- Physicians who transfer patients need to realize that the sending physician is liable for what goes on during that transport. Under EMTALA, physicians are responsible to ensure that the transfer is carried out with the use of qualified personnel and transportation equipment, as required by the circumstances; this includes the use of necessary and medically appropriate support measures during the transfer.
- To decide what “qualified personnel and transportation equipment” are needed to effect a transfer, you need to understand the differences among the different unit types in your EMS system. EMS systems are not all alike. If you are transferring patients, you need to understand the capabilities of these units.
- These units may range from an ambulette (basically a van that carries a wheelchair) to a Basic Life Support unit (a unit that essentially just gives oxygen and provides a stretcher for the patient) to an Advanced Life Support unit (a unit that can provide all of the lifesaving drugs that 911 units carry, but may be limited in its ability to handle more advanced patients) to a Mobile Intensive Care unit (a unit that may be staffed by physicians, nurses, or advanced care paramedics, who can handle just about anything such as intra-aortic balloon pumps, neonatal transfers, or other specialty situations). You need to understand what unit can take what type of patient in your local area.
- When do you call a helicopter? The Mobile Intensive Care unit may not always be a helicopter unit, but rather a ground unit that has the same capabilities. If you are closer than 25-30 minutes by ground to your receiving hospital, it is probably faster to transport via ground than a helicopter. Helicopters can minimize out-of-hospital time, which may be useful in transferring a critical patient, such as those with an intra-aortic balloon pump.
- If you are transferring patients, understand the capabilities of the crew you are assigning these patients to, because you are liable.
- The Ravenswood rule or 250-yard rule. This says that we are obligated to respond to any presentation warranting medical assistance within 250 yards of the main hospital campus building. In 2010, the Center for Medicaid Services wrote an exception to this rule.
- “If as part of the EMS protocol, EMS activates helicopter evacuation of an individual with a potential emergency medical condition, the hospital that has the helipad does not have an EMTALA obligation if they are not the recipient hospital, unless a request is made by EMS personnel, the individual or legally responsible person acting on the individual’s behalf for the examination or treatment of an emergency medical condition.” CMS transmittal number 60, dated July 16th, 2010.
- If you have a helipad that sits several feet away from your ER entrance and your local EMS units wants to utilize it, this is allowed. Your hospital will not incur an EMTALA obligation to that patient, assuming nobody asks for your help. It is much safer for the helicopter to land at the helipad than the scene.
- This is a good practice. It allows for the timely transfer of these patients in the safest manner possible. If things go south, there is an ER a few steps away that can help with the stabilization of the patient before the helicopter transfer.
- In summary, learn about the capabilities of the transporting units within your EMS system. Talk to your local EMS units and make sure they know that it is okay to use your helipad, if needed, for patients being transferred from the scene to your local trauma center.

**Boston Marathon: A First Person Experience**

**Jessica Mason MD interviews Bryan Canterbury MD**

- Canterbury is an Emergency Medicine physician at Cambridge Health Alliance and an Instructor of medicine at Harvard Medical School. He is a regular volunteer at the Boston Marathon and was there when the bombing occurred.
- Typical responsibilities while staffing the marathon include taking care of injured runners, hyponatremia, dehydration, miscellaneous aches and pains, and cramping muscles. The medical tent is about the size of a football field with cots, IV supplies, and fluids. They have the capability to test for hyponatremia. The tent is located around the corner from the finish line. There were 47 physicians staffing the tent; approximately 5-6 emergency physicians and the remainder were cardiologists, sports medicine physicians, etc.
- When the first bomb exploded, Canterbury knew what it was immediately. There was no doubt after the second explosion.
They ran to the area and began stabilizing patients. They did not know if there were other devices that had been planted, if it was a dirty bomb, or if there were shooters waiting. Patients were placed on boards, taken to a staging area for triage, and transferred to 1 of 6 medical trauma centers within 2 miles of the finish line.

- **What could have been done differently?** There was too much emphasis on starting IV lines. The focus should have been on stabilizing, placing tourniquets, and transferring the patients.

- **How were patients evaluated?** ABCs. Did they have a patent airway? Were they breathing? How can we stop the bleeding? This was done via tourniquets or pressure. Most of the injuries were to the lower extremities.

- **How were patients triaged?** They used the standard 1, 2, 3, 4, and 5 triage system. Patients who were triaged as category 1 went through the medical tent directly into a Boston EMS ambulance and were transported to the trauma center. After those patients were transported out, they worked on the category 2 and 3 patients. They used markers on the patient’s foreheads because they were unable to find triage tags immediately.

- **The location of the bombing saved lives.** They were located within 2 miles of 6 major trauma centers, including a dedicated children’s trauma center. The bombing occurred at 2:50 pm, so the 3:00 pm shift was arriving at the hospital and the morning shift stayed to help. Physicians also arrived from the outside to help.

- **How were the rescue efforts coordinated, if at all?** There were at least five separate groups: Boston police, Boston EMS, Boston Fire, medical volunteers from the Boston Athletic Association, as well as volunteers and bystanders. It was difficult to get everyone going in the same direction with one voice but fortunately, people were listening to those in authority. The people working with the physicians followed their commands. If there was no physician, Boston Fire or EMS was able to take a lead position and stabilize the patient. Sometimes, it’s the person who yells the loudest who is in charge.

- **They had very limited resources.** They had some tourniquets from Boston Fire. They used people’s belts for tourniquets and shoelaces. They used the ribbons from the finish line medals as tourniquets. It was a very different scene from the resuscitation room, where you have staff who know what their specific jobs are and IV carts, chest trays, and everything you need.

- **Being present in the scene made it very difficult to compartmentalize or keep separate.** Canterbury experienced insomnia and nightmares for several weeks afterwards. He had chronic headaches for a month. Very minor things would trigger a panic response. However, he was able to focus and do his job efficiently after several days of poor focus.

- **Some of the things that helped him cope included the support from family and friends, as well as the outpouring from the community for all of those affected.** He spent time with his family. Critical incident stress debriefings.

- **How can we deal with stressful events?** Gather the people who were also involved in a room in a nonjudgmental environment. Allow everybody to say what they’re feeling, what they felt on the day, and what they are feeling now. Just simply expressing emotion can help people down the right path. Residents should discuss with their attendings. You need to get the emotions out, otherwise you will be impaired as an ER physician.

- **Did Canterbury volunteer for the marathon again?** He ran in the marathon this year and will volunteer next year.

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**Paper Chase 5: Tibial Fractures in Kids**

*Sanjay Arora MD and Michael Menchine MD*


- For children under the age of 12 years, the risk of acute compartment syndrome for tibial diaphyseal (mid-shaft) fractures is zero.

- The risk of developing compartment syndrome is relatively high in adults with diaphyseal tibial fractures (about 3-5%). The diagnosis is usually clinical but may also be made via measurement of compartment pressures. A pressure over 40mmHg or a delta pressure (the diastolic pressure minus the compartment pressure) of over 30mmHg is generally considered highly predictive of compartment syndrome. Some institutions take a very conservative approach and admit all these patients for compartment checks overnight.

- Tibial fractures are the third most common fracture in childhood, but children seem to be at lower risk than adults for developing acute compartment syndrome. Estimates range from 0-4%. Some institutions also admit children for compartment checks.

- This was a retrospective analysis with not great methodology. They looked at 12 years of data on children with tibial fractures who were admitted to the hospital for observation per protocol. They identified 159 eligible children with an average age of 6 years. Children over the age of 12 years were excluded due to concern that adolescents would be more similar in risk to adults. Most of the fractures involved the middle or distal third of the tibia. Most had an isolated tibial injury but some had a tibia and fibula injury. 56% of the fractures were minimally displaced and required casting only. The other 45% were significantly displaced and most had manipulation under anesthesia or operative repair.

- No child developed an acute compartment syndrome, regardless of whether the fracture was minimally or significantly displaced and whether or not they received manipulation.
The authors concluded that admission is not necessary for minimally displaced tibial shaft fractures that are closed, low energy, and are neurovascularly intact. They recommended splinting with a posterior splint extending above the knee and discharging with early follow-up.

This was a small study but it does seem reasonable to discharge children with minimally displaced fractures, who are neurovascularly intact, have reliable parents, and have well-controlled pain. However, children who are very young and not ambulatory with a tibial shaft fracture should be evaluated for non-accidental trauma and may require admission.

Gun Violence
Christopher Barsotti MD

- You have patients who are mentally unstable. They have access to alcohol. They have access to handguns. They have not stated that they will kill themselves or other people. However, they say that they do not like the people at work and feel persecuted by them. “I am going to have to do something about it.” What should you do?
- What do firearms and access to firearms mean to the practice of Emergency Medicine? What clinical information do firearms convey? How does a patient’s exposure to firearms relate to medical decision-making?
- Most of us do not think to ask our patients, including suicidal patients, about firearms. Lethal means are relevant to suicide risk stratification. A study by Betz and Miller found that only 22% of ED providers asked suicidal patients about access to firearms. This went up to only 64% when informed the patient planned suicide by firearm.
- There are no professional recommendations about what access to firearms means. There are no recommendations regarding which patients to screen for firearm access and what to do with that information.
- This is not an everyday clinical occurrence but it does happen. We don’t know how often. You are more likely to have to deal with this issue than to decide whether to push thrombolitics in a 14 year old with stroke.
- Patients with mood disorders or other psychiatric illness account for a small proportion of gun violence overall and are more likely to be victims of violent crime than perpetrators. Of people with psychiatric disease who are inclined to be violent, most don’t seek treatment before perpetrating a violent act. The act of violence itself is often the sentinel indicator of disease.
- The vast majority of gun violence is perpetrated by individuals who use guns in a criminal way. They may have drug or alcohol problems, and they may have personality disorders or cognitive deficits, but they don’t have functional disease. These comprise the majority of the 11,000 gun homicides, 50,000 non-fatal injuries, and 400,000 gun victimizations each year.
- Patients who present to the Emergency Department are at higher risk for everything compared to any other environment. When evaluating patients at risk for self-directed or interpersonal violence, we are dealing with them at the front end of a crisis, which may result in violence. If they are in the ED, it means that there is a problem. This may be more familiar to providers in a community practice with limited specialty back-up than providers in an academic center with access to psychiatrists, where the ED role is limited to medical clearance prior to transfer to the psychiatric area.

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**Case**

You are on shift in a community ED when law enforcement brings in a patient for evaluation for a welfare check. They are concerned that he may be dangerous. The patient is minimally cooperative. He is easily agitated but able to calm down. He endorses some thoughts that are paranoid and delusional about people who may have done him wrong. He doesn’t make any specific threats and doesn’t endorse suicidal or homicidal ideation. He is not hallucinating and appears to have medical decision-making capacity. He seems moderately impaired. However, he has a large collection of guns and the conspicuous way he has been handling them has caused concern in his neighborhood.

When questioned, the patient says he is worried about trespassers but his guns are legal. You don’t have a psychiatrist available and there is a two-month wait to see the local private practice psychiatrist, assuming the patient has the right insurance. He wants to go home and you have no right to keep him there. **What do you do?**

- Dangerous individuals can’t be detained by law enforcement unless they have done something wrong. Transporting the patient to the Emergency Department transfers the responsibility for preventing whatever law enforcement is worried about to you.
- In situations like this, we only have one tool at our disposal: involuntary commitment. Laws regarding involuntary commitment vary between states but they all center around four central notions: the patient is suffering from mental illness; the patient is a danger to self or others due to mental illness; the patient is not intoxicated; and the patient requires a restrictive disposition for safety. This creates a high bar. Taking away a patient’s civil liberties without
complete justification can lead to trouble. However, determining danger to self or others is difficult. Can you prove this patient is dangerous due to mental illness? Would he be dangerous if he didn’t have a bunch of guns? That’s your call and your call alone.

- If you make the determination that the patient is dangerous and petition for involuntary commitment, you will be housing him in your Emergency Department for a prolonged period of time. Prolonged psychiatric boarding in the Emergency Department is a widespread problem. It is generally easier to transfer and place a voluntary patient than an involuntary one. There is a lot of pressure to get patients off the involuntary list. Sometimes, you may be able to arrange a safe disposition and get them to a lower level of care, but there is always a risk. It is a bad idea to let bed availability influence your disposition.

### Case

A similar scenario, but this time the patient is dropped off by friends. There is no police involvement. The patient appears hypomanic with some antisocial behavior. He doesn’t think there is anything wrong with him and he doesn’t want help. He seems paranoid and feels that he is being mistreated and his coworkers are against him. He is labile with poor impulse control, but he doesn’t seem to be a serious or imminent threat. You anticipate trouble if he were intoxicated, but he is not intoxicated at this time. He wants to leave. You notice that he has ammunition in his pockets. When questioned, he says that he carries a gun for protection. A concealed weapon is legal in your state. What do you do?

- Do you break confidentiality and call the police? After the killings at Newtown, Connecticut, the Department of Health and Human Services issued a letter to clarify that there is nothing in HIPAA that prevents physicians from alerting “those persons whom the providers believe are reasonably able to prevent or lessen a threat.”

- To disclose protected health information without consent, you have to show that the patient poses a “credible threat to inflict serious and imminent bodily harm on one or more persons.” Our patients are often not that obvious. In the preceding case, you only have circumstantial evidence and a patient with intact medical decision-making capacity, who is legally carrying a legal weapon and legal ammunition.

- Is your good-faith clinical concern enough? It is a physician’s responsibility to protect public safety. There is a good chance you could be sued for breach of confidentiality, but you’d be defensible. State law can supplement federal law on mandatory disclosures reporting suspected abuse, communicable diseases, etc. A few states have enacted legislation that requires providers to report firearm access, when they are concerned about possible or future violence, but these are primarily directed towards therapists and not physicians.

- There are no answers right now on what information firearm access may convey or how you should use that information in medical decision-making. Guns are ubiquitous. Sometimes, we need to consider our patient's access to firearms when making critical decisions.

- In an ideal world, there would be some best-practice guidelines for firearm risk stratification in the clinical setting. These might describe which behaviors in cognition, with respect to access to firearms, are worrisome enough to prompt intervention. It would be based on dynamic variables (e.g. whether or not a prudent layperson was concerned, if the behavior with weapons was not normal or safe, if they accessed a firearm when angry or impaired, etc.) and static risk factors (e.g. previous violent conduct, alcohol abuse, substance abuse, and prior victimization). It would involve collateral historians. If the patient has paranoid delusions, would the firearm help solve the internal conflict posed by the delusion? Does any behavior look like a rehearsal?

- You can’t commit everyone. The next step depends on state law, which is insignificant in the majority of cases. Legal guns are legal until they are used illegally.

- 53% of suicides are completed with firearms. In the right context, knowledge about a patient’s lethal means is an essential component of the history. Without it, you might not recognize how sick and unstable the patient truly is.

- The best solution is to have social rules that take our clinical concerns and professional accountability seriously, and permit us to act in accordance with our reasonable clinical judgment. This is not different from abuse of vulnerable patients. Our society has decided that vulnerable people, like children or disabled adults, should not be harmed. We are mandated to report any suspicion of abuse, and we are given immunity for good-faith disclosures in case we are wrong.

- A number of states have adopted legislation for the removal of firearms from tense situations. After the killings in Santa Barbara this year, California passed legislation to allow families and intimate partners to notify law enforcement when there is credible concern for gun violence, without the strict limitation of imminence. However, the provision including clinicians was taken out. This gun violence restraining order would permit us to act in accordance with our reasonable clinical judgment.

- The ER is the new psych ward. It is critical that our specialty advises its members about exactly what we are supposed to do to determine dangerousness and what to do when there is a gun involved.
It is only a matter of time until one of our psychiatric boarders is discharged home and does something bad with a gun. Until these issues are resolved, the day-to-day crises are going to be quietly settled by doctors who see that something needs to be done and do it, because that’s our job and we have no other choice.

- The FBI recently released a report showing that the average annual incidence of mass shootings has increased by more than 150% in the past 6 years. It is still uncommon, but a bad trend. Let’s be careful.

Annals of Emergency Medicine: Serotonin Syndrome and Opioid Analgesics
Mel Herbert MD and Paul Jhun MD

- Libby Zion was a college freshman with a history of depression on an antidepressant, who presented to the Emergency Department because she was febrile, agitated, and disoriented. She was admitted to the hospital overnight with a diagnosis of viral syndrome with hysterical symptoms. She was cared for by an unsupervised intern and second year resident who were working a 36 hour shift. Overnight, she became extremely agitated and was placed into physical restraints and given chemical sedation with haloperidol and meperidine. She eventually developed a temperature of 107°F (41.7°C), had a cardiac arrest and died. This case led to the mandatory resident physician duty hours.

- There are many medications that can cause serotonin syndrome. We give a lot of pain medications in the Emergency Department, especially hydromorphone. Which opioids cause serotonin syndrome? Which are safe to use?

- Serotonin syndrome can best be described as serotonin toxicity. Too much serotonin leads to problems. Serotonin is a neurotransmitter that makes us happy. Too much serotonin leads to the classic triad of altered mental status, autonomic hyperactivity, and neuromuscular excitability. Patients are hypertensive, tachycardic, diaphoretic, agitated, and altered. When you increase the levels of serotonin, symptoms manifest fairly quickly (minutes to hours). The treatment includes: discontinuing the causative agents, giving the antidote a serotonin antagonist cyproheptadine, and supportive care such as IV fluids, oxygen, benzodiazepines as needed. The dose of cyproheptadine is usually a first dose of 12 mg, followed by 2 mg every hour if symptomatic. If you need help, call your toxicologist or poison control.

- The list of medications that can cause serotonin syndrome is huge; MAOIs, TCAs, SSRIs, dextromethorphan, cocaine, methamphetamine, the triptans, antibiotics like linezolid, anti-emetics like ondansetron, and all of your anti-psychotics and anti-epileptics.

- Do all opioids have the potential to precipitate serotonin syndrome? Are there any that are safe? A literature search in OVID, using the search terms “serotonin syndrome” and “opioid analgesics” returned 70 articles.

- The most commonly reported opioids associated with serotonin syndrome were all synthetic: meperidine, tramadol, fentanyl, methadone. There were a few case reports of suboxone, hydromorphone and oxycodone but these were few and there were significant confounders in these reports, such as missing information.

- The four most commonly reported offenders were all in case reports or case series. There were no published case reports of serotonin syndrome associated with morphine, codeine, or hydrocodone.

- We see a lot of patients who take anti-depressants and psych meds with pain. You are better off using morphine, codeine, or hydrocodone.

- There is no role for antipyretics in the management of the hyperthermia associated with serotonin syndrome. If it is serotonin syndrome, the rise in temperature is due to increased muscular activity, not the hypothalamus. For severe hyperthermia, experts recommend sedation, paralysis, and intubation using non-depolarizing agents.