

# **Resources**

## **Airway Preparation Resources**

### **Tier 1 -- Minimal Acceptable Skill Set**

- [How to Set-Up Your Intubation Box](#) - Weingart runs you through what you need to know to set-up your airway box for the RACC.
- [Strayer Airway Management Checklist](#)
  - You must read this, and should understand the reasoning for every step
- [How to properly ventilate \(BVM/LMA\) a patient](#)
  - Its importance: sexiness ratio approaches infinity
  - For the love of God, do not squeeze the bag hard and fast. This is the opposite of chest compressions.
- [Direct vs. Video Laryngoscopy \(Strayer\)](#) - review of DL v VL and differences in blade geometries
- Laryngoscope as Murder Weapon Series
  - We intubate sick patients. Understanding how their physiology is failing and how that interacts with RSI is a necessary part of safely managing the critical airway. These three podcasts are a good introduction, but by no means the end of the story.
  - [Intubating the Severe Metabolic Acidosis](#)
  - [Intubating the Shocked Patient](#)
  - [Intubating the Hypoxic Patient Part I](#) and [Part II](#)
- [How to do a Cric](#) - by the one and only Ram P.
- [Logistics vs. Strategy](#)
  - You **must** know how to set up your bay for a safe intubation. The nurses might or might not know. Your attending might or might not know. If you are the resus resident on a given day, you are responsible for know where every piece of equipment is, if it is stocked, how to work your monitors, etc. Adopt this mindset early, and strive for it during your training.

### **Tier 2 -- Know By Midway Through PGY2**

- [The Failed Airway](#)
  - We will all reach this at some point in our career. Having a pre-built mental model of what to do is key.
  - See also: [The Shock Trauma Failed Airway Algorithm](#)
- [Vomit SALAD - Techniques during Massive Regurg, Emesis, Bleeding](#)
- The Awake Airway
  - Sometimes stopping someone's breathing is bad idea
  - [Awake Intubation](#)
    - This is an advanced maneuver, but knowing it is out there and thinking about when it is indicated will make you better
- What is this orotracheal intubation bias? You will come across tracheostomies and laryngectomies in your career, and need to know how to troubleshoot these airways as well.
  - [Trach Emergencies](#)
  - [Laryngectomy Emergencies](#)

### **Tier 3 -- Suggested**

- [Levitan on the Psychology of the Difficult Airway](#)
  - As PGY2s you will be put in a lot more critical situations that take you to a psychological place you don't really reach as PGY1s. You will always have backup

and you're never as alone as you might feel, but learning how to recognize, wrangle, and respond to your own stress is critical in your growth as an emergency physician.

- See also [The Day I Didn't Use Ultrasound](#)

## Breathing:

### Tier 1 -- Minimal Acceptable Skill Set

1. [Non-Invasive Ventilation](#) - if you can master this, you can prevent intubations for several patients, and/or maximally preoxygenate them if they need to be intubated.
2. **Dominating the Vent** - [Part 1](#) and [Part 2](#) - This is an excellent lecture that goes over the basics of ventilator management. Weingart reviews how to set up a ventilator, what settings to dial in for your intubated patients, and the logic behind these choices. **Essential Viewing.**
  - a. See also Weingart's Ventilator [review article](#) in the Annals (just 4 pages)
3. [Setting up the Vents at Elmhurst](#) - A step-by-step walkthrough on how to actually set up the ventilators at EHC.
4. [The Post-Intubation Package](#) - whew, you successfully intubated your sick patient in cardiac/resus. Don't stop now though, there is a boatload of stuff you need to do in order to optimize their care.
5. [Post-Intubation Sedation and Analgesia](#) - This lecture by Emcrit will get you through the basics of how to set up an adequate sedation package for your intubated patients.
6. [Troubleshooting the Ventilator \(DOPES\)](#) - Uh oh, your patient is hypoxic on the ventilator. What do you do? This is an easy mnemonic that reviews how to troubleshoot post-intubation complications.

### Tier 2 -- Know By Midway Through PGY2

1. [Ventilator Assisted Preoxygenation \(VAPOX\)](#) - how to use the ventilator to provide preoxygenation in a smooth, controlled way.
  - a. **NIV For Preox** (Featuring Elmer Siong!) - <https://vimeo.com/31311379>  
**AND** <https://vimeo.com/148790744>
2. [Standard BVM Doesn't Work for Shunted Lungs](#) - it is sometimes difficult to bag a patient with shunted lungs (lungs that have fluid/pus in them, which is hindering oxygenation). This video directly shows what happens to a cadaver's lungs when you add some PEEP onto your standard BVM.
3. [High Flow Nasal Cannula](#) - why would you use it, and when?
4. [Management of the Severe Asthmatic](#) - an intubated asthmatic is an "oh shit" moment for any medical intensivist. They get more dangerous when intubated. Here is a great podcast reviewing the nuances of their management pre and post-intubation.
  - a. [NIV For Obstructive Lung Disease](#) - read this to get a sense about how to combat hypercapnea in your obstructed patient. TLDR - increase your IPAP to assist in work of breathing.
5. [Oxygen Physiology and Pulse Ox Latency](#) - essential information you should know about how the pulse ox works

### Tier 3 -- Suggested (CC Nerds)

1. [DSI](#) - What is **Delayed Sequence Intubation**, and why would you consider using it for a patient in the ED?
2. [Proning for ARDS](#) - review the benefits of prone positioning for your severe ARDS patients. Something you can try in the MICU/SICU.

## **SEDATION & ANALGESIA GUIDELINES FOR MECHANICALLY VENTILATED PATIENTS**

PRIORITIZE ANALGESIA-FIRST SEDATION STRATEGY<sup>1</sup>  
AVOID BENZODIAZEPINES<sup>1</sup>

### **SEDATION TARGET**

#### **RASS (Richmond Agitation Sedation Scale)**

-1 = Awakens to voice (eye opening/contact) > 10 sec

-2 = Briefly awakens to voice (eye opening/contact) < 10 sec

OK TO BE DEEPER IN IMMEDIATE POST-INTUBATION PERIOD

### **PUSH-DOSE SEDATION & ANALGESIA**

**Fentanyl:** 50 - 100 µg

**Morphine:** 0.1 - 0.15 mg/kg

**Remifentanyl:** 1 - 1.5 µg/kg

**Propofol:** 0.25 - 1 mg/kg

**Ketamine:** Analgesia: ~ 0.3 mg/kg. Sub-dissociation: 0.1 - 0.5 mg/kg. Dissociative: 1-2 mg/kg.

**Haloperidol:** 0.5 - 10 mg

**Dexmedetomidine:** 1 µg/kg (over 10 min)

**Midazolam:** 0.02 - 0.1 mg/kg

### **SEDATION & ANALGESIA DRIPS**

**Fentanyl:** 50 - 350 µg/hr

**Remifentanyl:** 0.01 - 0.25 µg/kg/min

**Propofol:** 5 - 80 µg/kg/min

**Ketamine:** 1 - 2 mg/min

**Dexmedetomidine:** 0.2 - 0.7 µg/kg/hr

**Midazolam:** 0.04 - 0.2 mg/kg/hr




### **References**

1. Barr J, Fraser GL, Puntillo K, et al. Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. Crit Care Med. 2013;41(1):263-306.
2. [http://www.medscape.com/viewarticle/741166\\_3](http://www.medscape.com/viewarticle/741166_3)
3. <http://emedicine.medscape.com/article/809993-overview#a2>

**Circulation:**

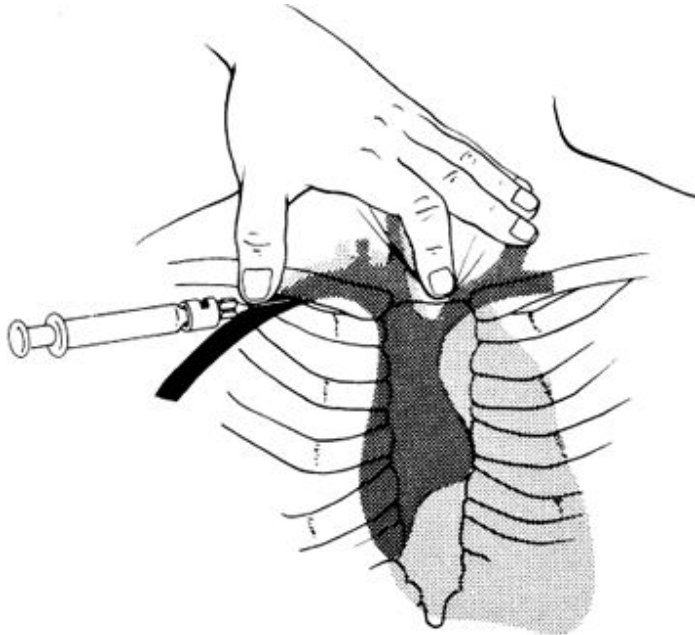
**Tier 1 -- Minimal Acceptable Skill Set**

- Know your Access!
  - **Intraosseous Line** [EZ-IO Site](#) - This company site has it all. Tells you about the tool, indications, locations for placement, complications and contraindications. Read it.
  - **Venous Central Line**
    - Types, Indications, complications

Triple Lumen Catheter (TLC)	Cordis/Introducer	Shiley
		
<p>Indications:</p> <ul style="list-style-type: none"> <li>● IV administration of pressors</li> <li>● TPN</li> </ul>	<p>Indications:</p> <ul style="list-style-type: none"> <li>● massive transfusion</li> <li>● trauma</li> <li>● TVP</li> <li>● Swan-Ganz</li> </ul>	<p>Indications:</p> <ul style="list-style-type: none"> <li>● Dialysis, no other access exists</li> <li>● one opening for blood leaving the body, one for blood returning</li> </ul>
<p>Complications: -vary by location</p> <ul style="list-style-type: none"> <li>● infection &gt; sepsis</li> <li>● arterial/venous damage &gt; bleeding</li> <li>● PTX</li> <li>● pneumomediastinum</li> <li>● air embolism</li> <li>● thrombosis</li> <li>● arrhythmia</li> </ul>	<p>Complications: -vary by location</p> <ul style="list-style-type: none"> <li>● infection &gt; sepsis</li> <li>● arterial/venous damage &gt; bleeding</li> <li>● PTX</li> <li>● pneumomediastinum</li> <li>● air embolism</li> <li>● thrombosis</li> <li>● arrhythmia</li> </ul>	<p>Complications: -vary by location</p> <ul style="list-style-type: none"> <li>● infection &gt; sepsis</li> <li>● arterial/venous damage &gt; bleeding</li> <li>● PTX</li> <li>● pneumomediastinum</li> <li>● air embolism</li> <li>● thrombosis</li> <li>● arrhythmia</li> </ul>

- **Contraindications**
  - Less invasive forms of IV access are possible and adequate
  - Overlying skin lesion such as cellulitis or burns
  - Uncorrected bleeding diathesis
  - Obstruction of the vein by tumour, mass or thrombosis
  - Uncooperative patient.
- **Steps to Placement**
  - **Step 1: SetUp and Sterile Technique**

- [Full Sterile Technique for Central Line](#)
- A couple of points:
  - Not shown, but first step for a full sterile line is washing your hands.
  - If at any point, your field is contaminated during placement, YOU MUST DOCUMENT THE LINE WAS NOT PLACED WITH FULL STERILE PROCEDURE. Those doctors upstairs need to know.
  - Here is [another video](#) that is vintage, filmed at Elmhurst Hospital.
- **Step 2: Line Placement**
  - Watch one of these videos demonstrating IJ Line placement with ultrasound, now the standard of care:
    - [US Guided IJ Central Line](#)
    - NEJM – [Video](#) is thorough, formal. For those who like a mechanical voice.
  - Subclavian
    - [Subclavian Line Placement](#). This line is all about the landmarks. Because this video is done with sterile procedure, it's a bit hard to see the landmarks. Here is an image to check out:



*Figure 1 Thumb at midpoint of clavicle, Index finger at sternal notch*

- **Step 3: Confirming Venous Placement (Choose at least 1)**
  - Observation of the intravascular pressure waveform using an electronic transducer and pressure tubing

- Determination of the of the intravascular pressure using sterile tubing as a venous manometer. [Here is a video of using wire casing from the kit to transduce pressure. Neat!](#)
  - Analysis of the PO2 of a blood specimen drawn from the needle/catheter compared to simultaneously drawn arterial blood (this is stupid!)
  - Bubble Test-when saline is rapidly injected through the catheter (or the angiocath if you haven't dilated yet), there is opacification of the echocardiographic view of the right heart structures. [Here, Bret Nelson shows us the steps of the bubble test complete with a video as well. Thanks Dr. Nelson!](#)
  - Chest Xray
  - Using real-time fluoroscopic or echocardiographic confirmation of venous catheterization (e.g., visualizing the guide wire or catheter within the superior vena cava)
  - Using a contrast study to opacify the venous structures. Less Desirable: Guidewire Visualization in the Vein
- Arterial Line
    - Read through this [nice outline](#) of arterial lines including indications, complications and troubleshooting.
    - This is how to do an [Arterial Line Set Up](#).

#### **Tier 2 -- Know By Midway Through PGY2**

- Complications: They happen and, as the doctor, you need to know em. Here is a [review article](#) that is a good overview of the most common complications and recommendations for managing them.
- [Pressor Basics: Need to Know](#)
- [Push Dose Pressors](#)
- [Peripheral Pressor: A conversation you will have a million times, good to know](#)

#### **Tier 3 -- Ya Nerd**

[Central Line Micro Skills. For when you are ready to play varsity.](#)

For those ultrasound enthusiasts, [here is a podcast](#) of subclavian line placement by ultrasound. Not common practice. They do make a summer sweater chest hair joke.

[Tips from Strayer](#) about placing a central line with wire through the catheter.