

CA-1 Anesthesiology Rotation Primer

Welcome to your CA-1 year! This packet was made to help guide you through your first month.

Overview of your first month

Most of you will be in the main LLUMC OR during July. In the main OR, you will be paired with a CA-2 or CA-3 each week during this month who will be your mentor for that week. You'll work with them each day that week, unless they are post-call or feel that their cases for a day are less appropriate for you to do, in which case they will find you a different room to work in. Treat the cases as if they are your own, not your senior's; this month it is your responsibility to thoroughly pre-op patients the night before and communicate your plans to your CA-2/3 and attending (more on this below).

For the IM/anesthesia combo CA1s, we know that you didn't get a month in the OR during your intern year, and you will not be expected to be as comfortable as your cohorts right away. However, it may be a good idea to remind the seniors/attendings you work with your first week of this, so they can teach you appropriately. For example, it is appropriate to ask your senior to be the one to send pre-op plans to the attending (and you) for the first week, then you take over the role your 2nd week.

For those of you that are not in the main OR in July, don't panic! You will have the same experience as above, but in August. Here is what to expect during the other rotations you may be on in July:

- **PACE:** this is our pre-anesthesia clinic. It is mostly run by NPs (and excellent RNs who handle a lot of logistics for you). You will be seeing patients, writing pre-op notes, making decisions about whether patients need further testing prior to their procedure, and ordering any necessary testing. There is always an attending on call for PACE; they are not physically at the clinic but are available by phone. Don't be afraid to ask them questions! The NPs are also a good resource for getting you used to the process. The clinic is located at 25835 Barton Rd., Suite 101, and hours are typically 8-5.
- **VA OR:** In July at the VA, you will most likely be paired with CRNAs. The VA folks will be sending you more information from their end, but if not, reach out to Chiqui.DeGuzman@va.gov. If you can get to the VA ahead of time to do some of the onboarding that can be helpful. Otherwise, it may take a while to get access to the med carts and things like that (but everyone there is used to that and will help you get meds if needed).
- **VA Regional:** On this rotation, you will be doing nerve blocks for acute postoperative pain on Mondays, Wednesdays, and Fridays, and working in the chronic pain clinic Tuesdays and Thursdays. They will be sending you more information from their end, but if not, reach out to Chiqui.DeGuzman@va.gov.

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Logistics

Pre-ops

- Chart review the night before - pay attention to medical history, allergies, current meds, etc. Some residents find it helpful to write this info down on a card or paper for each patient.
- Decide on a plan for your anesthetic. It is a good idea to read the appropriate section in Jaffe prior to making your plan. Plan should include vascular access, airway management, whether blood is needed, and any special considerations for the particular case or patient. Err on the side of writing too much information in your plan for now.
- Contact your attending (and senior resident, while you are paired) and send them your pre-op. It is appropriate to contact them by phone, pager, or email. If you email your pre-ops, text page the attending to let them know that you've sent an email. Side note: whenever you text/page an attending, give them a callback number or 2way so it's easy for them to get back to you if they need to.
- When you contact your attending, include a learning topic that you would like to discuss the next day
- Our goal is to communicate with attendings before 8pm, but sometimes that's not possible due to the schedule coming out late, personal obligations, etc. If that's the case it, is a good idea to give the attending a heads up so they know to expect your pre-ops later.
- When you meet the patient in the pre-op area the morning of surgery, these are the topics you should be sure to discuss with them: allergies, PMH (go through each organ system), NPO and pregnancy status, beta blocker use, METs and personal/family history with anesthesia.

OR set up

- MSMAIDS
 - **Machine:** turn off then back on (machine will run self-tests while starting up), then follow the instructions on the screen to complete the machine check
 - **Suction:** make sure there is actually suction generated when you turn it on. If not, something probably came disconnected.
 - **Monitors:** Confirm their presence. Consider attaching EKG electrodes ahead of time.
 - **Airway:** If you are planning to intubate, check the ETT balloon by inflating, make sure light works on the blade you plan to use. Make sure an appropriately sized LMA is available for emergencies. If you suspect a difficult intubation, consider having a Glidescope in the room.
 - **IV:** have an IV start kit ready to go. Spike a bag of IV fluids if the patient is coming from the floor (they won't have orders to hang one in pre-op).
 - **Drugs:** First thing to do when logging into the med cart is an inventory of the narcotics (Manage meds -> custom inventory -> open top drawer and select all the narcotics -> count each pocket). Label syringes before drawing up meds, and check that the label matches the drug vial as you draw each one up. Make sure you have pre-filled syringes of emergency meds (phenylephrine, ephedrine, dilute epinephrine, atropine, succinylcholine).
 - **Special monitors/equipment:** art line, central line, SedLine, etc. if indicated.
- Additional emergency equipment to check: backup O2 source, Ambu-Bag

Documentation

- **Prior to the case:** update pre-op note, hit "anesthesia ready", open the "Intra" tab and add staff, apply macro if desired
- **After induction:** write the anesthesia airway note, write notes for any other procedures (art line, central line), add any additional PIVs placed, chart induction meds, chart antibiotic if given, complete "Best Practice Documentation" checklist
- **Throughout the case:** regular assessments to include vent mode, EKG, TOF assessment. Chart all meds given including IVFs.

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- **After the case:** Go through the sections of the “Post” tab: vitals, transfer of care, confirm anesthesia type, anesthesia stop. Make sure meds given at the end of the case are documented accurately, as well as IVF totals, urine output, and EBL. Update anesthesia note to include emergence information. Waste any narcotics.

Handoffs:

- **Handing off to another resident during a case:**
 - Open the pre-op note to go through the patient’s PMH, cardiac and pulmonary status, allergies, indications for surgery.
 - Tell them about the airway (were they easy or difficult to bag and intubate?).
 - Familiarize them with your vascular access, where you are pushing meds, and how much fluid you have given so far.
 - Make sure your documentation is updated so they can refer to it if they have questions.
 - Pass along any special requests from the surgeon
 - If they are giving you a break, give them specific instructions about what you’d like them to do while you are gone (examples: keep the patient paralyzed, draw an ABG, avoid opiates, etc.). If they are taking over the case, tell them what your plans were for the rest of the case, and why.
- **Handing off to a PACU nurse:** This is a more brief handoff, but still include the patient’s name, age, brief PMH, allergies, procedure performed, vascular access, what has been given for analgesia, and EBL. Also alert them to any difficulties you had managing them in the OR (hypotension, bronchospasm, etc.), and anything in particular they should keep an eye out for in recovery (ex: increased UOP could be a sign of DI after an intracranial case).

Tips for this month

- Find your login information for the ACGME website and start logging your cases
- Ask lots of questions. If you have trouble coming up with questions and there is downtime during your case, here are some ideas:
 - Ask about an emergency they’ve dealt with in the OR
 - Go over steps to take and differential if the patient were to become hypoxic, hypotensive, etc.
 - Go through the ASA difficult airway algorithm
 - Fluid management
 - Ventilator settings and when to use different ones
 - PONV prophylaxis strategies
 - Factors that can prolong neuromuscular blockade
 - Choosing a method of airway management (LMA, different types of ETTs)
 - Talk about whatever topic you are learning about in lecture that day
- Introduce yourself to as many people as possible, especially attendings. If they don’t recognize you, they may not know whether to treat you like a med student or a CA1.

Recommended textbooks

- [Anesthesiologist’s Manual of Surgical Procedures](#) (Jaffe)
- [Basics of Anesthesia](#) (Miller)
- [Clinical Anesthesiology](#) (Morgan and Mikhail)
- [Faust’s Anesthesiology Review](#)
- [Anesthesia: A Comprehensive Review](#) (Hall)

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Basic anesthesiology topics you should become familiar with:

(Note that this list is far from comprehensive)

Dosages and duration of action of commonly used drugs:

- Propofol
 - Dose for induction of GA: 1-2.5mg/kg
 - Time to onset of effect: 30-45sec; Duration of effect (for bolus dose): 2-8min
- Fentanyl
 - 50-100mcg is often given before induction of GA to blunt sympathetic response to laryngoscopy and enhance the effects of other anesthetics. Small intermittent boluses (25-50mcg) are also used for analgesia when an inhalational anesthetic is used for maintenance of GA.
 - Onset: 4-6min; Duration of effect (for single bolus dose): 30-45min
- Hydromorphone
 - In the OR, we give smaller doses (0.1-0.2mg at a time, up to about 0.01mg/kg depending on how much post-op pain is expected) than you are used to giving on the floor. This is because hydromorphone is longer acting than other analgesics we use intraoperatively and therefore needs to be carefully titrated (you can't take it back if the patient gets hypotensive or apneic).
 - Onset of effect: 5-10min; Duration of analgesia: 4-6 hours
- Etomidate
 - Induction dose: 0.15-0.3mg/kg
 - Onset: 30-45sec; Duration of effect: 3-12min
 - Downsides: more painful than propofol, can have myoclonus after injection, increased PONV, adrenal suppression
- Succinylcholine
 - Intubation dose: 1-1.5mg/kg
 - Onset: 1-2min; duration: 7-12min
- Rocuronium
 - Dose: 0.6mg/kg for standard induction.
 - Intubating conditions in 1.5-3min for 0.6mg/kg dose, similar to succinylcholine for 1.2mg/kg dose
 - 0.6mg/kg dose lasts 30-70min
- Cisatracurium (brand name Nimbex)
 - 0.15-0.2mg/kg provides intubating conditions in 4-7min; effects last 30-50min
 - Metabolized by Hoffman elimination and has no active metabolites - good for pts with liver/kidney failure.
- Lidocaine
 - We give it on induction for the following reasons: 1) blunting airway responses to laryngoscopy; 2) to decrease pain on injection of propofol/etomidate; 3) enhancing the sedative-anesthetic effects of the other drugs used
 - Dose for blunting response to DL: 1-1.5mg/kg
- Common antibiotics for surgical prophylaxis:
 - Cefazolin: Covers skin flora. Use 2g if <120kg, 3g if >120kg. There is some cross-reactivity with penicillin allergies - don't use if history of anaphylaxis with PCN. Redose Q4hrs.
 - Clindamycin: usual adult dose is 900mg. Redose Q6hrs. Can be an alternative to cefazolin in PCN allergic pts.
 - Vancomycin: usual dose is 1g. Don't usually need to re-dose. Another alternative to cefazolin.
 - Imipenem: often requested for surgeries involving the bowel. Give 1g; don't re-dose.
 - Metronidazole: sometimes requested in GI surgeries. Dose is 500mg and pre-made bags are kept in the pump room between ORs 13 and 14.

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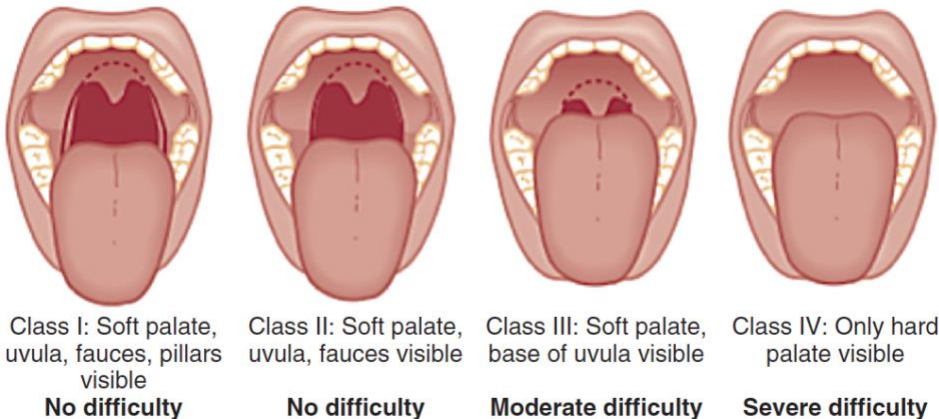
Reversal of neuromuscular blockade

- **Checking twitches:** best surrogate for diaphragmatic recovery is thumb adduction from ulnar nerve stimulation. Don't reverse (with neostigmine) if there are not at least 1-2/4 twitches.
- **Choosing a dosage**
 - Dose of neostigmine is 0.03 - 0.07mg/kg (concentration is 1mg/mL), up to 5mg. In general, give an equivalent volume of 0.2mg/mL glycopyrrolate to prevent muscarinic effects.
 - Sugammadex: give 2mg/kg if 2+/4 twitches, 4mg/kg if 1-2/4 post-tetanic twitches, 16mg/kg for rapid reversal of neuromuscular blockade shortly after administration of 1.2mg/kg rocuronium.
- **Timing**
 - For an abdominal surgery, wait until the fascia is closed to reverse
 - Neostigmine can take 20min+ to fully reverse rocuronium (have at least 10min in between administration of neostigmine and extubation)
 - Sugammadex reverses rocuronium within 2-3min (in most patients)
- **Other things to know about sugammadex:**
 - Only works on rocuronium and vecuronium (aminosteroid class neuromuscular blockers)
 - Serious reactions include bradycardia and anaphylaxis
 - If given to a woman using hormonal contraceptives, advise her that she will need to use a backup method of birth control for 7 days
 - Not approved for use in patients with severe renal impairment (it's renally excreted) or in children (lack of data).

The ventilator: You will have lectures on the ventilator, but many of us found the following simplification helpful as well: https://www.howequipmentworks.com/circle_breathing_system/

Airway

- **Mallampati scores:**



- **Cormack-Lehane grades of laryngoscopic view:**
 - Grade I: full view of the entire glottic aperture including the entirety of vocal cords
 - Grade II: partial view of glottis
 - Grade III: Only the epiglottis is visualized
 - Grade IV: Cannot even visualize the epiglottis
- **Being prepared for difficult airways (expected or unexpected):** Always have a backup method of airway management in mind in case your initial plan fails. Keep in mind that repeated attempts at laryngoscopy will only make intubation harder and be ready to move on to a different method of airway management. Use the rule of thumb of changing at least one thing with each

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attempt at intubation (blade, person intubating, position, method). Understand the ASA difficult airway algorithm: <http://anesthesiology.pubs.asahq.org/article.aspx?articleid=1918684>

Extubation criteria

- **The patient must be:**
 - **AWAKE** enough to protect their airway. Make sure they can follow commands.
 - **STRONG** enough to breathe on their own. Make sure they are taking adequate tidal volumes off the vent, and can give either 5 second hand grip or head lift. Make you reversed paralytics.
- ** Check for an airway leak. This is not always necessary, but most important to check after an extended ICU intubation, prone case, if a lot of fluid/blood was given. Check by deflating the ETT cuff, giving a positive pressure breath, and listening for air escaping around the tube.
- Suction the mouth prior to extubation and in most cases extubate with positive pressure so the patient will clear any pharyngeal secretions by coughing.
 - Immediately after extubation we check spontaneous ventilation by applying a sealed mask to check EtCO₂ return and tidal volume.

Common Intraoperative Emergencies

Think about how to diagnose and treat each of these. Discuss them with your senior resident or attending to make sure you understand (and ask them for examples of scenarios that they have dealt with).

Hypotension differential:

- **Pump** (Cardiac): rate & rhythm, contractility (ischemia, pre- & intra-op meds, cardiomyopathy), valvular lesions, HOCM, high airway pressures.
- **Pipes** (Afterload): vasodilation (anaphylaxis, sepsis, adrenocortical insufficiency, drugs (including our anesthetics, sympathectomy, vasoplegia), pulmonary embolism (venous air, thromboembolism, CO₂, amniotic fluid)
- **Fluids** (Preload): hypovolemia (bleeding, NPO, bowel prep, diuresis), impaired venous return (postural, surgical compression, pneumothorax, cardiac tamponade).

Hypoxia:

Actions:

- First place pt on 100% FiO₂, high flow, handbag and check other vitals.
- Listen to lung sounds
- Check position of ETT and connections in the circuit. Consider suctioning ETT.
- Check surgical field for causative factors

Differential:

- Machine: low RR or VT, low FiO₂, circuit leak
- ETT: kinked/obstructed, mainstem intubation
- Pt: mucus plug, atelectasis, anaphylaxis, hypotension, bronchospasm, COPD, OSA, neuromuscular disease, pulmonary embolism, pulmonary edema, pneumonectomy.
- Iatrogenic: paralytic, opioids, upper airway compression
- Monitor Error: cold limb, methylene blue, blue nail polish, tourniquet, BP cuff

Instructions on common procedures:

- IJ central line placement: https://www.youtube.com/watch?v=fMylXjt_ja4. Note that unlike in this video, with ultrasound we do not expect to puncture the back wall of the vein, we suture our central lines in place and use a biopatch, and we do not get a CXR in the OR.
- Radial artery catheterization: <https://www.youtube.com/watch?v=8hK04ai17-k> (this video does not show the equipment that we use, but is more in depth) or <https://www.youtube.com/watch?v=bu9vOYM5Lmg> (shows the type of catheter we have)

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Notes on specific types of surgeries:

Spine surgery with neuromonitoring

- Somatosensory evoked potential (SSEP) and/or motor evoked potential (MEP) monitoring is sometimes used during neurosurgery. When the potentials decrease during a case, it may be due to neurologic insult caused by the surgery and is a warning sign for the surgeon.
- Our anesthetic agents, especially volatile anesthetics, reduce the amplitude and increase the latency of evoked potentials (MEP>SSEP). Therefore, we often use TIVA (total intravenous anesthesia) for these cases. Most commonly this is with propofol and remifentanyl.
- If MEPs are being used, don't use paralytic, and make sure the patient has a soft bite block

Laparoscopic surgery

- When the abdomen is insufflated: ETT can become mainstemmed, peak airway pressures increase, vagal stimulation can cause bradycardia/hypotension, PVR and SVR increase, CO₂ is absorbed, and patient may become hypercarbic

Robotic surgery

- Patient movement when the robot is docked can be catastrophic. Keep them paralyzed and make sure you have a way of monitoring twitches.

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Contact Information

CA-2s:

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Mandy (Manshu) Yan: 626-566-5145

Useful phone numbers:

Anesthesia service director (adults): 51350
Anesthesia senior resident: 53170
Adult OR control desk: 44410
Peds OR control desk: 44442
Pharmacy IV room: 42286
Blood bank: 45346
PACU: 42231

Useful pager numbers:

ABG: 8600
ACT: 1908