Adult Cardiothoracic Anesthesiology Fellow Guide

Last Updated June 2020

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Welcome to VUMC CT Anesthesiology Fellowship!

This will be a busy, fun, challenging, rewarding time. This guide exists to help decrease the time it takes for you to settle into our system, and as a guide for many of our procedures. We hope this helps as you become more familiar with VUMC!

Helpful phone numbers:

Anesthesiology techs: 615-34**3-6770**, 615-480-7367

VUH OR Board: 615-32**2-2090**

VCH OR Board: 615-936-0027

Blood Bank (adult): 615-32**2-2233**

VUH OR Pharmacy: 615-32**2-4897**

CVICU Charge Phone: 615-47**3-6148**

ECMO/Perfusion: 615-416-0418

AIC (main OR): 615-887-7379 – attending in house

R1 (first call resident, in house): 615-887-7369

C1 (CRNA in charge in the day): 615-456-9872

From an internal phone, just dial the **BOLD** numbers.

Vanderbilt-isms

Locations and General Starting Advice

Scrubs: The OR scrub area is on 4th floor TVC. There is not strict policy to cover scrubs outside of the OR. You can wear department approved jackets into the ORs. Jillian will give you a scrub machine code.

ORs:

3 VUH Main OR: Cardiac is in rooms main OR rooms 5, 6, 7. Thoracic in is main OR room 4, sometimes also in OR 36/37 if robot case. Bronchs are mainly performed in OR 28 & 29 (not usually our responsibility).

5 Critical Care Tower (CCT): CL/EP: There are 4 EP rooms (EP1 is hybrid, EP 2-4). There are several Cath Lab rooms as well; CL1 we staff daily, and it is also a hybrid room. To get to CL/EP from VUH main OR, you take the double elevators near OR5 up to 5th floor. When exiting the elevators, all EP rooms are on your right, and all CL rooms are on your left. Keep going straight to the PACU/Preop. If you are assigned to EP, you can get most of your controlled substances and drips from the Accudose machines outside the rooms including norepinephrine. Call pharmacy for epi drips. If you are assigned to CL1 for TAVR/ Mitraclip, you should get a cardiac box from main OR pharmacy.

CL1/hybrid: If you are assigned to CL1, get a cardiac box from main OR pharmacy.

Preop Documentation/Orders:

- Elements of a cardiac preop that always needs to be present.

⇒ There is a button to copy forward preops. Judicious use of this copy forward, as this imports the previous physical exam and plan.

- TEE/TTE results

⇒ Find under Chart Review -> Cardiac -> TTE or TEE OR Results Review -> Cardiac -> Echo

⇒ If patient had an echo at an outside facility try Chart Review -> Media

- Cardiac Cath results

⇒ Chart Review -> Cardiac OR

⇒ Results Review -> Cardiac section -> Cath

- T&S results

⇒ If none has been performed, go to “Orders” -> “Type and Screen” -> Order for preop holding “STAT” (or if inpatient, just order without preop phase of care)

⇒ If positive antibody screen, Call the blood bank at 22233 ASAP to discuss the antibody. How long to match blood? How many units available? Will they need to obtain blood from another area?

⇒ Discuss with attending. Should plan to order 4 units PRBCs in a cooler.

3VUH Tech room (code 513): This is located on the east main OR hallway near ORs 35/17. (No, our numbering does not make sense).

The code to the door is 513. Tech cell: 36770

- Immediately to your right: The wood look cabinets have cardiac setup equipment like “rainbow stopcocks”, fluid warmer, a-line supplies, PACs, CVL kits. We are not expected to restock our rooms or bring these supplies to our rooms, just an FYI if you need to do your setup before the techs have brought your fluid warmer and “rainbow”.
- The rows to your left have general supplies like airway equipment, monitoring equipment, tubing, syringes, etc.
- The techs bring your “rainbow” stopcocks and fluid warmer to the OR. They routinely bring a triple spike transducer setup (A-line, CVP, PA), MAC CVL, VIP Swan Ganz, claves, preps, CHG dressing, and ultrasound probe cover. They put O2 on the ICU beds and if they know you’re running Filan will provide a transport setup of that plus extra O2 tank on ICU bed.
- Call the techs (36770) for items you need for your room. They restock in between cases. You are not expected to restock your room.
- For blood gases: Call the techs at 36770.

5N CVICU – Our ICU has 27 beds (5001-5027). It is located on 5th floor VUH North tower. There is an office near the main elevator entrance to the unit where NPs and fellows work, near beds 5001 and 5027. The CVICU has CT anesthesia admissions (rounded on by our team) and CCU admissions, rounded on by a cardiology team. The CCU team sits in the opposite corner of the unit near 5015.

- If you need a VAS CATH for a patient going to CVICU, call the CVICU charge nurse to obtain this and they will instruct you

Critical Care Tower – The elevators we take from OR 5 to 5th floor to transport are in the critical care tower. Floors of interest:

- 9th floor: SICU
- 8th floor: MICU
- 6th floor: Neuro care ICU
- 5th floor: EP/Cath lab
- 3rd floor: Our ORs

TVC Core – This is where the cardiac team (FAs, nursing, CSLs, etc) have a whiteboard. This whiteboard is better updated during the day than the main OR electronic board. Also, in the core:

- Supply closet across from OR 7 has useful goodies.
- Zoll pads, batteries , yellow double stopcocks, autologous transfusion collection bags, micropuncture kits are on the wire racks.

Pharmacy:

Cardiac Box:

- Pick this up from pharmacy if you are in MOR 5, 6, 7 or in CL1. Other areas as indicated.
- Box Includes:

⇒ Heparin vials (10,000U/10mL)

⇒ Protamine vials (250 mg/25 mL x 2, 50 mg/5 mL x 2)

⇒ Pre-made syringes: "Baby epi" 10 mcg/mL (usually 2 syringes); Cardene (200 mcg/ml x 2)

⇒ Vaso 20u/mL x 2

⇒ Amiodarone 150 mg/3 mL x 2

⇒ MgSO4

⇒ CaCl2 1000 mg/10mL x 2

⇒ Metoprolol

⇒ Bicarb syringe x 1 (50 mEq)

⇒ Drips: propofol, dobutamine, lidocaine, as well as the "drip pack" placed by pharmacy upon box request with norepinephrine (8 mg/250 mL), aminocaproic acid, nicardipine, insulin

⇒ Verify Norepi is in the box when picking up from pharmacy

- Top drawer of "Blue Bell" cart contains many medications that are restocked daily by pharmacy

Alaris Pumps Continued

- Left to right on bottom pump (not standardized):

⇒ Propofol

⇒ Insulin (located in "All Meds" section of Alaris)

⇒ Others: nicardipine, dexmedetomidine, vasopressin, 2nd inotrope, ERAS medications, etc

- If you are with an "ERAS" attending, or doing a heart transplant or LVAD, have a third set of Alaris pumps available.
- Pump Setup: "Adult Critical Care" mode, Anesthesia mode enabled, turn up air detection to 500 microliters, alarm volume down. Most medications are found under "All meds" section in the Alaris library.

Drugs to Draw Up:

- Heparin is in cardiac box – DOSE: 300U/kg TBW
- Lidocaine, propofol, fentanyl, rocuronium, +/- vaso. We sometimes have vaso premade syringes of 1U/mL x 2 mL from pharmacy.
- Make a norepi stick (1mL from norepi infusion with 9mL normosol) = ~3 mcg/mL
- Make a flush syringe with two claves on it, labelled "flush" (for VIP Swan Ganz)

Pharmacy: We do not make our own drips. Pharmacy also makes many pre-drawn syringes. This was an effort to prevent us from pre-drawing syringes for next cases. Propofol is not controlled.

- To get narcotics you must fill out a carbon copy sheet. You keep the cardstock bottom copy.

⇐ Pharmacy makes premade syringes "sticks" of methadone (10 mg/1mL) and ketamine (50 mg/1mL).

⇐ Other ketamine available is 500 mg/10 mL

⇐ Dilaudid in 1mg/1ml

⇐ Ketamine premade drips: 100 mg/ 50 mL bags

- Available on request:

⇐ Drips: dexmedetomidine (200 mcg/50 ml), Epinephrine (4 mg/250 mL, gets 4 hrs. out of fridge), phenylephrine (30 mg/250 mL vs 25 mg/250 mL), propofol

⇐ Other: hydrocortisone, ropiv/bupiv, many others.

⇐ You may need a "top drawer restocks" throughout the day and will need to either go to pharmacy for this re-stock or call and have them send your grocery list of items.

- Accudose (in OR core):

⇐ Cefazolin, KCl, diphenhydramine, famotidine, CaCl2, Albumin 5%, nitroglycerin

⇐ Amicar (aminocaproic acid): program at 2g/hr with 10g bolus to start

- Left to right on top pump (standardized):

⇐ Normosol at 100 ml/hr

⇐ Norepi in mcg/min – attach to double stopcock

⇐ (Inotrope) – attach to double stopcock

Carrier line: 1L Normosol, Alaris tubing -> rainbow stopcocks -> 24" a-line high pressure tubing (with yellow cap on one end) -> double stopcock (double stopcock and high pressure tubing can be reversed if desired for left-sided MAC line placement).

Alaris Pumps: You need a pole with minimum 2 Alaris pumps with 4 channels each. We dose norepi and epi in mcg/min (non-wt based).

Basic Setup:

☐ **Complete "Cardiac Room Setup" Checklist.**

These items that come in the case cart pack:

- Yellow double stopcock (this goes on the end of your infusion line and connects directly to the white port of the MAC).
- NIRS – typically 2 stickers. (Costly $$, ~100/ea)
- Zoll pads
- Purple donut head pillow

TEE/Others Setup:

- Order TEE and have patient information input into TEE machine

⇒ In eStar Orders section, either select “Intraoperative Transesophageal Echo (TEE)” from the “VUMC AN QUICK LIST” or manual enter “Intraop echo” in the orders text box and hit Enter. Complete order prompts.

⇒ After this is ordered: Go to TEE machine and go to worklist, “update worklist” then search by name. Select “OK.”

⇒ Select linear probe, CVP imaging, then freeze image (for use while inserting your CVL)

- Get your TEE probe ready:

⇒ Verify it is clean – clean tag on the ring on the handle

⇒ Use stopcock extension tubing (stopcock removed) to create a rope on TEE handle (thru the ring

⇒ Place green bite block on probe (facing the appropriate direction)

⇒ Place lube packet on tip. Please leave in the box for best protection until ready for use with lid closed (per Dr. Deegan).

- Make a wrist roll for arterial line, with tape.
- Have your gloves ready for a-line, CVL, PAC. We double glove for CVL/PAC placement. We also re-drape with towels for PAC placement.

Basic Case Flow:

Start and pre-bypass: In general, refrain from charting unless everything is caught up.

- On entry to room, scan patient in room.

⇐ The FA will place a mepilex dressing on the patient’s sacrum.

⇐ Move the PIV carrier fluid and vancomycin to your pole.

⇐ As efficiently as possible, attach pulse ox and BP cuff to the patient, as well as BIS/NIRS if indicated. If FA helps with EKG leads, move ahead to get wrist setup for arterial line.

- A-line:

⇐ Setup: usually the techs set this up. There is a sterile pack in the case cart that opens as a table cover with plastic tray, high pressure tubing, and gauze inside. Add: Prep, Arrow, TB syringe, 5mL 1 or 2% lidocaine, Straight needle suture, Dressing of choice (CHG Tegaderm), 10 pack towels

⇐ This is set up on top of linen cart. Bring to appropriate side of patient. Tape down wrist with roll, prep to antecubital fossa, and towel out in a large rectangle to include wrist and large length of radial.

⇐ Hand off the female end of the tubing to your helper who will attach to the pressure line and flush to you. Place a folded towel over the tubing to hold in place.

⇐ Ask for an US probe cover if needed, use hockey stick probe from TEE machine

⇐ Suture in arterial line

⇐ Ask helper to help with the sedation for the arterial line and for preoxygenation during placement if possible.

⇐ Induce, intubate, tape in tube, place patient in Trendelenburg.

⇐ Place TEE probe. Hang probe by loop of extension tubing onto IV infusion pole. Plug in probe.

- **MAC CVL**: THERE ARE 8 SHARPS IN THE MAC KIT.

⇐ Prep neck. May be done by helper.

⇐ Open MAC kit on the same linen cart as you used for arterial line. Drop two sets of gloves, US probe cover, and prep stick onto the sterile field.

⇐ WASH YOUR HANDS

⇐ Put on your gown and gloves

⇐ Set up the kit. Get flush from PIV line with helper.

⇐ Place the central line, usually under US guidance.

⇐ Discard your outer gloves. Use your prep stick to prep the introducer port of the MAC catheter. Towel out your introducer port with 2 blue towels.

⇒ PAC: your helper will open your PAC. Float PAC.

⇒ Once PAC floated, announce “Anesthesia ready” and take down the drape. Note the time.

- Connect to CVL:

⇒ Connect your infusions with yellow double stop cocks to the WHITE port of MAC

⇒ Hot line to brown port

☐ Complete “Pre-Bypass” Cardiac Case Checklist

- Expect shifts in blood pressure

⇒ INCREASED BP during incision, pericardiectomy

⇒ DECREASED BP during LIMA harvest

⇒ DECREASED BP after heparin administration

☐ Complete “Going on Pump” Checklist

* Critical: Achieve adequate heparinization (ACT > 480)

* Assess for aortic dissection after cannula placement

☐ Complete “While on Pump” Checklist

* Critical: Prepare for coming off!

Complete “Rewarming” Checklist

* Critical: Notify attending, Send labs, pacer available

Complete “Coming off Pump” Checklist

* Critical: Warm, Ventilate, Rhythm, Meds
* ANNOUNCE PROTAMINE HALF IN

Complete “While Closing” Checklist

* Critical: Call report, GET A BED ASSIGNMENT, **Flolan?**
* **CVICU Charge Nurse Phone # 615-473-6148**

Complete Report to CVICU Checklist

* One-liner: Age, Sex, Pertinent PMHx/allergies, case
* Lines: Location, type, any pertinent difficulties
* Airway: type and difficulty
* Pertinent pre-bypass events and echo findings
* Separation from Bypass: Rhythm, pacing, wires, meds
* Current infusions +/- Flolan
* Ins/Outs
* Labs, including most recent ABG
* Last NBM: Discuss +/- reversal

Spark Learn:

Repository for vertical and horizontal clinical pathways that can be accessed by navigating to:

https://spark-learn.app.vumc.org/

Login with your VU Net ID and PW.

Adult CT Anesthesiology is the main hub for CT faculty and fellows

TEE Basic Help:

How to access and review TTE/TEE images in HER

- Access to TEE images can be obtained after the exam is “closed” on the TEE machine. We view these images remotely using “Impax CV Review Station.” You can access this software a couple of ways:

1. Connect to the CAR-General-VAWS in VMware
   ⇐ Open Impax CV Review Station
2. Open Impax CV Review Station on the middle fellow computer desktop in the office
   ⇐ The middle fellow computer also has 3D datasets in the Philips software for practice.

- If you receive a screen resolution error, double click the “Change Resolution” icon in the virtual machine.

How to Order a TEE

- Patient must be in CVICU, Holding, or the OR
- Orders -> VUMC AN Quick List -> Intraop Orders -> TEE

CVICU Handoff:

Essentially, a narrative of the case proceedings

- Handover

⇐ Ventilator: Ensure patient connected to ICU Vent

⇐ Vitals: Connect patient to CVICU monitor prior to report

⇐ Team: ICU APRN/PA, Attending, Fellow, Bedside RN

⇐ "Is everyone ready?"

- Elements of the narrative

⇐ Patient Name, Age, significant PMHx, procedure done

⇐ Induction events, Airway Difficulty, Lines placed

⇐ Pre-bypass events (stable vs unstable)

⇐ Pre-Echo findings

⇐ Relevant bypass info (long, unstable, NIRS, Circ arrest?)

⇐ Post-Echo findings

⇐ Ins/Outs

⇐ Current infusions +/- Filoan if present

⇐ Pacing ability and dependency

⇐ "What concerns me most..."

⇐ NBM: Discuss reversal if indicated

TEE Quick Guide

Aortic Valve

Aortic Root	Normal Range/ULN
Annulus/LVOT Diameter (systole)	23-29 (m) 21-25 (f)
Aortic Root @ sinuses of Valsalva (d)	37 (m) 33 (f)
Sinotubular Junction (d)	32 (m) 29 (f)
Ascending Aorta (d)	34 (m) 31 (f)
Descending Aorta (d)	30

Aortic Stenosis	Moderate	Aortic Regurg	Moderate
Valve Area	1 –1.5 cm^2	Vena Contracta	3 –6 mm
Peak Velocity	3—4 m/s	Jet / LVOT (w)	25-64%
Peak Gradient	40-70 mmHg	Jet / LVOT SCA	5—59%
Mean Gradient	20-40 mmHg	Jet Depth	Tip of A L
Dimensionless Index	0.25—0.50	PHT	200—500 ms
		EROA (cm^2)	0.1—0.29
		Regurg Vol	30—59 cc
		Regurg Fraction	30-49%
		PVL circumfer-ence	20-30%

Special Thanks to Dr. Kelly
Mishra for the original
"Kelly TEE Bible"

How to Submit/End a Study

- Hit "End Exam" on the top right side of the touch screen. This will start the upload.
- In EP, do not immediately close the lid and power off the echo machine after ending exam. It takes several minutes to upload your exam.

How to find a paused TEE Study

- If an echo machine is accidentally powered off, it will not re-open your study automatically.
- To re-open you study:

⇒ Power on the machine

⇒ Go to Worklist -> History -> Reopen Exam

⇒ It will say "Paused" if you paused it or the machine lost power and "Ended" if you ended the exam.

⇒ You can still add images to an "Ended" exam. Follow the prompts on the echo machine.

How to manually enter patient information if TEE worklist is not updating

- Enter first and last name
- Enter MRN without the first 0
- Enter ascension number: In eStar -> Chart Review -> Cardiac -> TEE Order Acc# Original

Mitral Valve

Mitral Annulus	ULN
Diastole	32 (diastole = open)
Systole	36 ant-post (130 degrees), 46 med-lat (130 degrees)

Mitral Stenosis	Moderate
Valve Area	1-1.5 cm^2
PHT	220/PHT -> 150-200
DT	760/DT
Mean Gradient	5-10 mmHg
Peak PAP	30-50

Mitral Regurg	Moderate
Vena Contracta	3—6.9 cm
Jet Area	4-10 cm^2
Jet area/LA Area	20-40%
PISA Radius	4-9 mm
VC Area (cm^2)	0.2—0.39
Regurg Vol	30-59 cc
Regurg Fraction	30-49%
Pulm Vein S	Blunted
E wave Velocity	0.8—1.2

- Hypovolemia = LV EDD < 2.5 cm or EDA < 55 cm^2
- E-point separation > 15 = EF < 30%
- McConnell's Sign = mid free wall akinetic, normal apex

RV Size	Normal
Infundibular diameter	< 3.5 cm
Basal diameter	< 4.1 cm
Mid diameter	< 3.5 cm
Thickness	< 0.5 cm

Ventricles

LV	Normal
LV (A-P) Diastolic	M 4.6—5.4 cm F 4.1—4.9 cm
LV (A-P) Systolic	2.5-3.6 cm
IV Septum (d)	0.6—1 cm
Fractional Short	25-30%
FAC (2d)	> 35-45%
EF (3d)	> 55%
E-point separation	< 7 mm

RV	Normal
TAPSE	> 17 mm
RVFAC	> 32%
RVEF	> 45%
RV/LV Size	< 1:1
RV dP/dt	< 400 Ab Nml
Width/ Length	< 0.6
PAPI	> 1

Tricuspid and Pulmonic Valves

Tricuspid Annulus	ULN	Dilated
Diastole	23-33 mm	40 mm

Tricuspid Stenosis	Severe
Valve Area	<1 cm^2
Mean Gradient	> 5 mmHg
Peak Velocity	> 1.5 cm^2
VTI	> 60 cm
PHT	>190

Tricuspid Regurg	Moderate
Vena Contracta	3—6.9 cm
Jet Area	5-10 cm^2
PISA Radius	6-9 mm @ 30
EROA by PISA	0.2-0.39
Regurg Vol	30-45 cc
IVC Diameter	21-25 mm
CW Jet	Dense
Hepatic Vein	S blunting

Pulmonic Annulus	ULN
Systole	24 mm

Pulmonic Stenosis	Severe
Peak Velocity	> 4 m/s
Peak Gradient	> 64 mmHg
Valve Area	< 0.5 cm^2

Pulmonic Regurg	Severe
Jet Size (annulus)	> 70%
CW Decel Slope	< 260
PA Flow	Holo D Reversal

PAP	Moderate
PV AT	80-100 ms

VADs	Inflow V Peak	Outflow V peak	PI	Speed
HM III	< 150 cm/s	< 200	2.5—5	5—6
HVAD		< 200	> 2	2.4—2.8

Pre-VAD	Post-VAD
AI (> mild -> Fix) LV Thrombus MS PFO/ASD RV Function/TR LAA Thrombus Aortic Atheroma LV diameter	Inflow Velocities (< 1.5 m/s) Outflow Velocities (< 2 m/s) Cannula position Ascending aorta RV function Air AV opening/time LV diameter (decompressed)

Diastology

Diastology	Normal	Impaired (Grade 1)	Pseudonormal (Grade 2)	Restrictive (Grade 3)
E DT (ms)	160-240	> 240	160-200	< 160
E:A	1-2	< 1	1—1.5	> 1.5
Pulm Vein	S > D		Systolic Blunting	
e'	≥ 10	< 10		
E / e'		≤ 8	9—12	≥ 13

Pre Myectomy	Post Myectomy
Septum Thickness (**diastole**) Distal point of thick septum Septal contact point RCC to septal contact point LVOT obstruction -> gradient MV leaflet length & coapt AML > 33 mm -> plication AML > 44 mm -> resection MR (eccentric post-lateral)	Residual LVOT obstruction Residual SAM Residual MR VSD (PA sat > RA sat)

Post Valve Replacement
Valve well seated Leaflet mobile / Nml antegrade glow Valvular functional jets (<2.5 cm nml) Paravalvular leaks Pressure Gradients Effective Orifice Area Obstruction LVOT (MV Strut) SAM (if AV prosthesis is small)

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