IVUS-guided Aortic Branch Cannulation – in vitro protocol

- Each phantom should take 5 mins per user - Order – Jonah, Boat, Brett
- for 3 users - that's ~10-15 mins per phantom
- Each phantom should take 15 mins to map
- **Things to point out when participants arrive -** best to go above and let **fall in**, reference point on the wire**,** fast as possible (speed), verifying cannulation with fluoro, don't overdrive, warning to not move bed, show steerable catheter, 90 degree view rotation, authorship

K6 (pva mapped before, give demo), K1, K12, K5, K3, K4 (pva), K8 (pva)

Room Setup:

- Ensure **Nikon camera is set to 25 fps**, long lens, place very up close on high stand [ ]
- ensure correct ML model loaded [ ]
- presave data directories on computer **for all 7 phantoms and load preop data for each! [ ]**
- Have deformation registration directory also open for troubleshooting [ ]
- Ensure yaml parameters look correct [ ]
- Turn pump frequency down to ~70bpm [ ]
- Use syringe to remove air from pulsatile pump [ ]
- ensure tubings submerged where possible [ ]
- Lock the table in place [ ]
- Setup camera looking at fluoro screen and surgeon + fluoro + IVUS [ ]
- Reference point on wire [ ]

Mapping of phantom (for each phantom):

- Place phantom in tank, remove bubbles
- If not enough motion, change construction
- Position fluoro
- (Inkbit) 16 Fr sheath
- (PVA) Feed guidewire up, Clip IVUS catheter into pullback device
- Start recording with (1) **cameras** in room, (2) **screen** recording, (3) click **'start recording'** in aortascope, and (4) click **start pullback device** in that order

Registration contingency plans (20 mins)

1. Run registration again – or try viterbi
2. Replay data – conf class 2 threshold, tsdf voxel size, ML model
3. Registration tuning – dbscan eps, downsampling CT mesh, allowable stretch factor, angle filter ransac, renal order swap injective mappings, bin / full selected for 4D reg
4. IVUS mapping only (say nthng) and record transform data (superimpose CT scan later)

Side branch navigation:

0. Cover phantom with black cloth, plug in steerable catheter
0. Check if wire is still decent quality / exchange at end of each run
0. Be sure to save previous surgeon's **transform data** (if using IVUS TSDF or deforming phantom)
0. Turn on **pulsatile pump** – for video even if pullback device not used

2. **record with** (1) **cameras** in room, (2) **screen** recording (above all else)
3. **Start the clock - manipulated to be at 90 degrees** to the side branch vessel for clear side view
    - perform a **shot of fluoroscopy to verify** successful cannulation, press **Lap** function
4. Every time surgeon **fires fluoro = 1 cannulation attempt**

Materials checklist:
Remember to book relevant materials on lab google calendars

Computational cart:
- tape
- IVUS machine
- EM station
- EM emitter
- EM tracker stand (Anthony lab)
- PIM module
- USB splitter
- marker for drawing on fluoro screen
- basin to prevent water leakage
- pump-aorta large inlet connector
- black cloth
- second cart for monitor (for now)
- pullback device
- pullback device power chord
- pullback device USB cable
- pulsatile pump
- computer
- computer monitor facing out
- computer charger
- frame grabber
- optional: frame grabber for fluoro
- optional: additional stand for computer monitor
- mouse
- keyboard
- supply boxes
- dash monitor
- camera
- camera stand
- iPhone stand
- data recording sheets
- pens
- screwdriver
- scissors
- lighter
- beaker
- extra basin for dumping water
- wooden/plastic board as metal table alternative
- barbell weights
- guidewires consolidated in box sizes
- loop closure connectors
- PVA phantom boxes
- inkbit phantoms
- M6 wrench
- towel
- dryseal

- velcro (male and female)

supplies:
- printed protocol
- barbell weights
- IVUS + EM catheters
- steerable EM catheter
- steerable catheter
- computer monitor
- guiding catheters
- guidewires
- contrast agent
- puffing catheters
- surgical drapes
- syringes for contrast agent injection

FEVAR specific:

- ensure surgeons wearing scrubs and lead
- add nester coils if needed, apply whiteout, add nester coils (record video), resheath graft
- map and register the aneurysm
- (record video) deploy graft while recording
- map graft with guidewire – change vpC, sim device, refine, deeplumen params as needed
- call centreline_caller, rename refine
- (record video) register graft with beads
- (record video) fenestrate graft, clicking highest to lowest orifices
- cannulation
- **FEVAR branch deployment AFTER ALL studies**