Curriculum development session for ultrasound in Year 1&2

**Session on blood vessels and CVP**

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| **Learning Modalities** | **Assessment** |
| 1-independent learning | 1-multiple choice |
| 2-lecture or TBL | 2-SP encounters, simulation, observation, portfolio (folder of collected images) |
| 3-small group, PBL, hands on w/ coach | 3-short essay or oral examinations |
| 4-deliberate practice |  |
| 5-direct observation (1:1) or assessment |  |

**Objectives:**

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| Focus | Objective | Modality | Assessment |
| Basic Concepts | Review physics of flow through tube/vessels* Laminar flow vs turbulent
* Pressure/flow rates arteries/veins
 | 1,2 |  |
|  | Review how US can evaluate anatomy;wall motion & blood flow via modalities of us (B-mode, M-Mode, Doppler (colorpower,pulsed) | 1,2 |  |
|  | Describe how the angle/direction fo the probe/waves relative to flow affects Doppler modalities | 1,2 |  |
|  | Review function of knobs/settings on quality/appearance of image: depth/gain/frequency* Prescribe strategies for various applications
* Describe common problems encountered
 | 1,2 |  |
|  | Demonstrate ability to visualize vessel* Adjust settings (change depth/gain) & optimize/edit image
* Differentiate arteries from veins
* Visualize Doppler flow
* Quantitate their size & flow
* Assess wall motion (m-mode)
 | 3,5 |  |
| Communi-cation | Explain the information needed to obtain informed consent from a patient for any ultrasound | 1,3,5 |  |
|  | Incorporate /demonstrate the appropriate relationship building skills (empathy, rapport building, education) into the patient encounter during the ultrasound procedure | 1,3,5 |  |
| Clinical skills | Compare/contrast/describe the variability of venous anatomy in terms of size, location, response to stimulus ie HJR, standing,valsalva,breathing  | 4 |  |
|  | Locate the femoral artery/vein, then compare the ultrasound findings (using knowledge of vessels/flow characteristics) | 4 |  |
|  | Determine (in femoral triangle and carotid sheath) which vessel exhibits pulsatile flow utilizing doppler | 3,4,1 |  |
|  | Determine proper probe selection with regards to anatomical location and body habitus | 3,4,1 |  |
|  | Estimate CVP using m-mode of IVC (diameter, collapsibility, changes with respiratory cycle) | 4,5 |  |
|  | Predicting volume status by estimate CVP using ultrasound and relate to the findings on clinical exam | 3,5 |  |
|  | Differentiate veins from arteries utilizing histologic, gross anatomical, physiological and US characteristics  | 3,5 |  |
|  | Acquire ultrasound images of major central veins and use various ultrasound modes to estimate CVP | 3,5 |  |
| Anatomy/Physiology | Predict the effect of normal physiological changes on venous flow and capacity:* Baseline respirations, valsalva, direct compression (contrast proximal vs distal)
* Physiological states (parasympathetic vs sympathetic
 | 3,4 |  |
|  | Relate the appearance of arteries/veins (caliber/location/compressibility) based on location in the body (trunk vs extremities)* Compare to the histology of arteries and veins
 | 3,4 |  |
|  | Compare and contrast veins/arteries utilizing histologic, gross anatomical, characteristics by ultrasound and physical exam |  |  |
|  | Describe the function of the venous valves & hypopothesize the effect of introducing valves into central veins (SVC/IVC) | 3 |  |
|  | Discriminate between arteries & veins on histologic sections | 3 |  |
|  | Trace the veins (SVC, IVC, hepatic/portal vein, etc) in cadavers and by ultrasound | 3 |  |
|  | Predict/explain effect of body position on venous capacitance & CVP | 3,4 |  |
|  | Review coagulation cascade | 1, 4 |  |
| Pathology | Compare/contrast DVT and compartments | 3,4 |  |
|  | Relate/ Explain/compare & contrast pathophysiology of :* Physical examination findings
* Ultrasound findings
* anatomy
 | 4 (PBL) |  |
|  | Review effects of venous stasis on clotting | 1,4 |  |
|  | Explain mechanism of edema | 1,3,4 |  |
|  | Explain effect of :* obstruction (flow, clots, PE, dvt, compartment syndrome)
* increase pressure ie/ portal hypertension
* decreased intravascular volume (blood loss, dehydration, third spacing
* pump failure (right heart failure, tamponade)
 | 4, PBL |  |
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