

# Vascular Access

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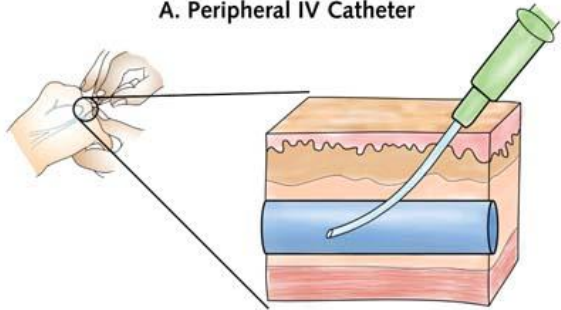


Why?

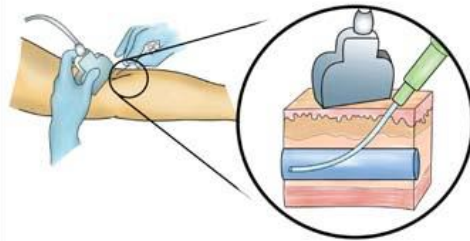
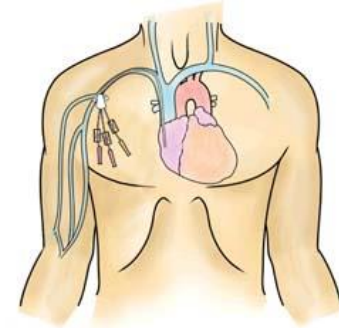


Unfortunately not all of our patients look like that...

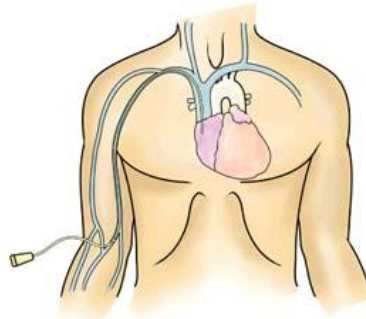
**A. Peripheral IV Catheter**



**D. Nontunneled Central Venous Catheter**

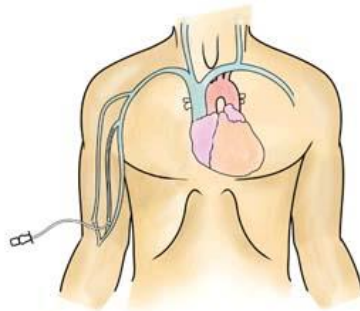
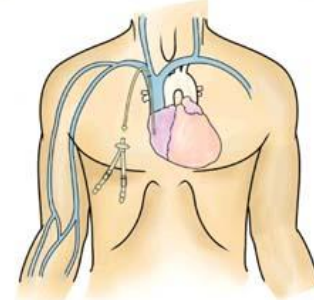


**B. US-Guided Peripheral IV Catheter**

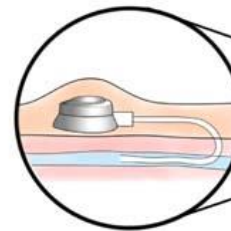


**G. Peripherally Inserted Central Catheter**

**E. Tunneled Central Venous Catheter**

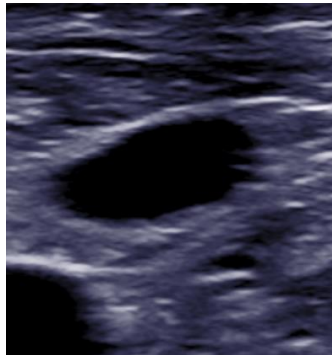


**C. Midline Catheter**

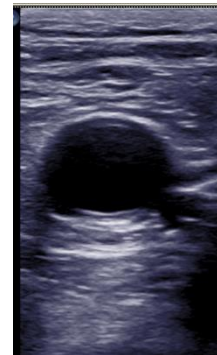


**F. Implanted Port**

# Recognize vasculature



Veins	Arteries
No Wall	Visible Wall
Oval/Round	Round
Not pulsatile	Pulsatile
Compressible	Not compressible
Blood flow direction	Blood flow direction

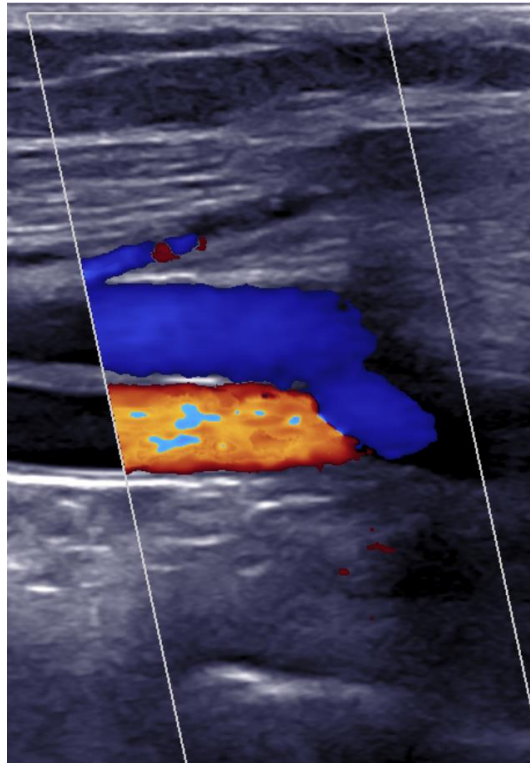


# Compressibility



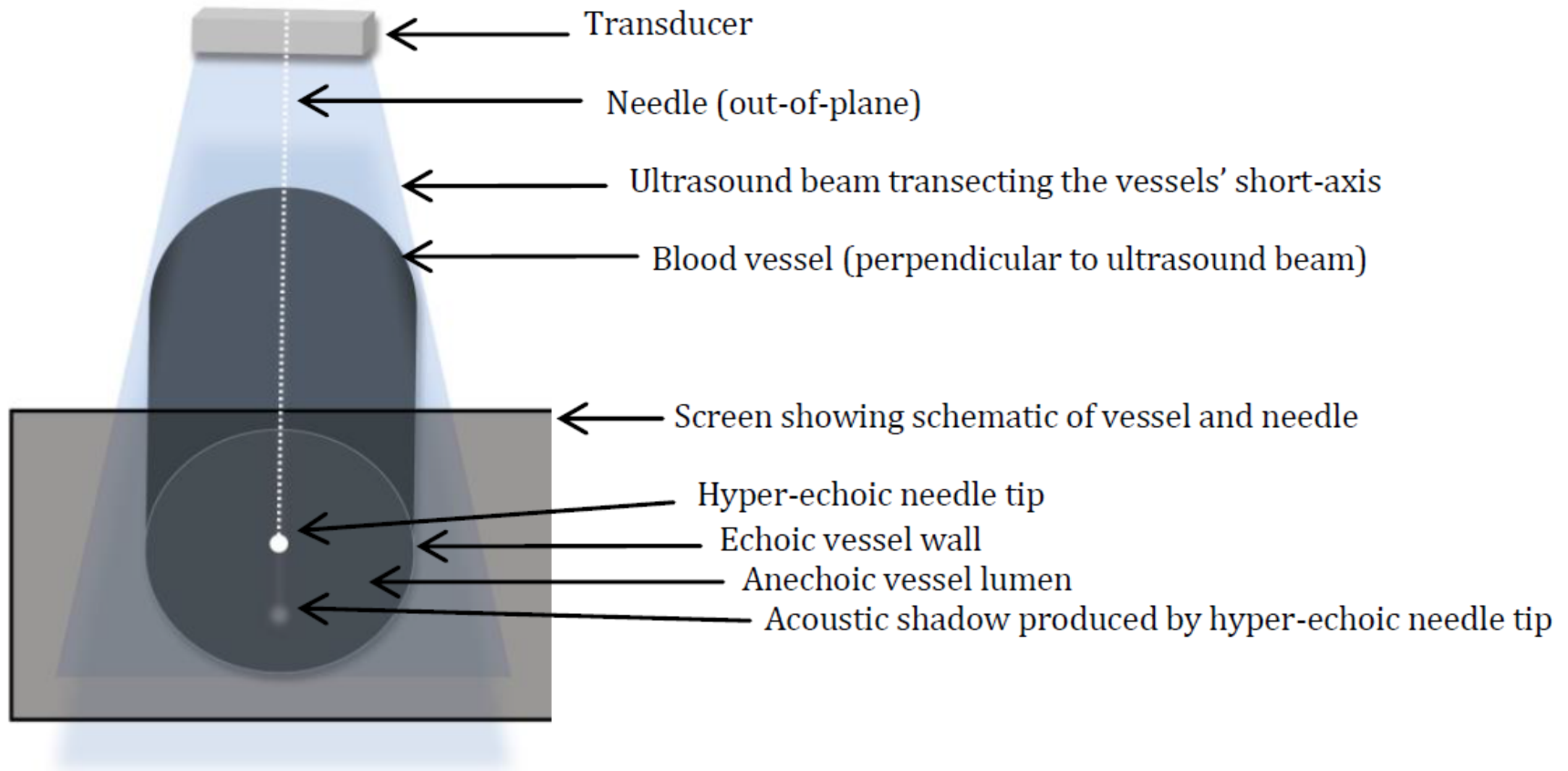
# Colour Doppler and Blood flow direction

- Convention: blood flow towards probe: **red**  
blood flow away from probe: **blue**
- If probe perpendicular to vessel: no colour visible
- The higher the speed: the brighter the colours



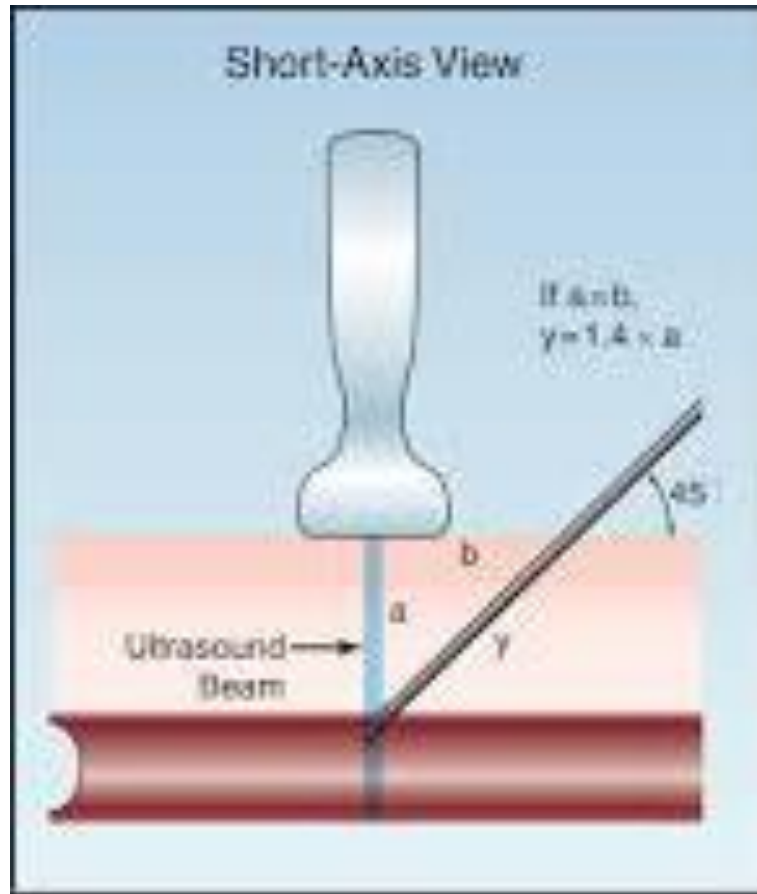
# Out of Plane vs. In Plane

# Out of plane



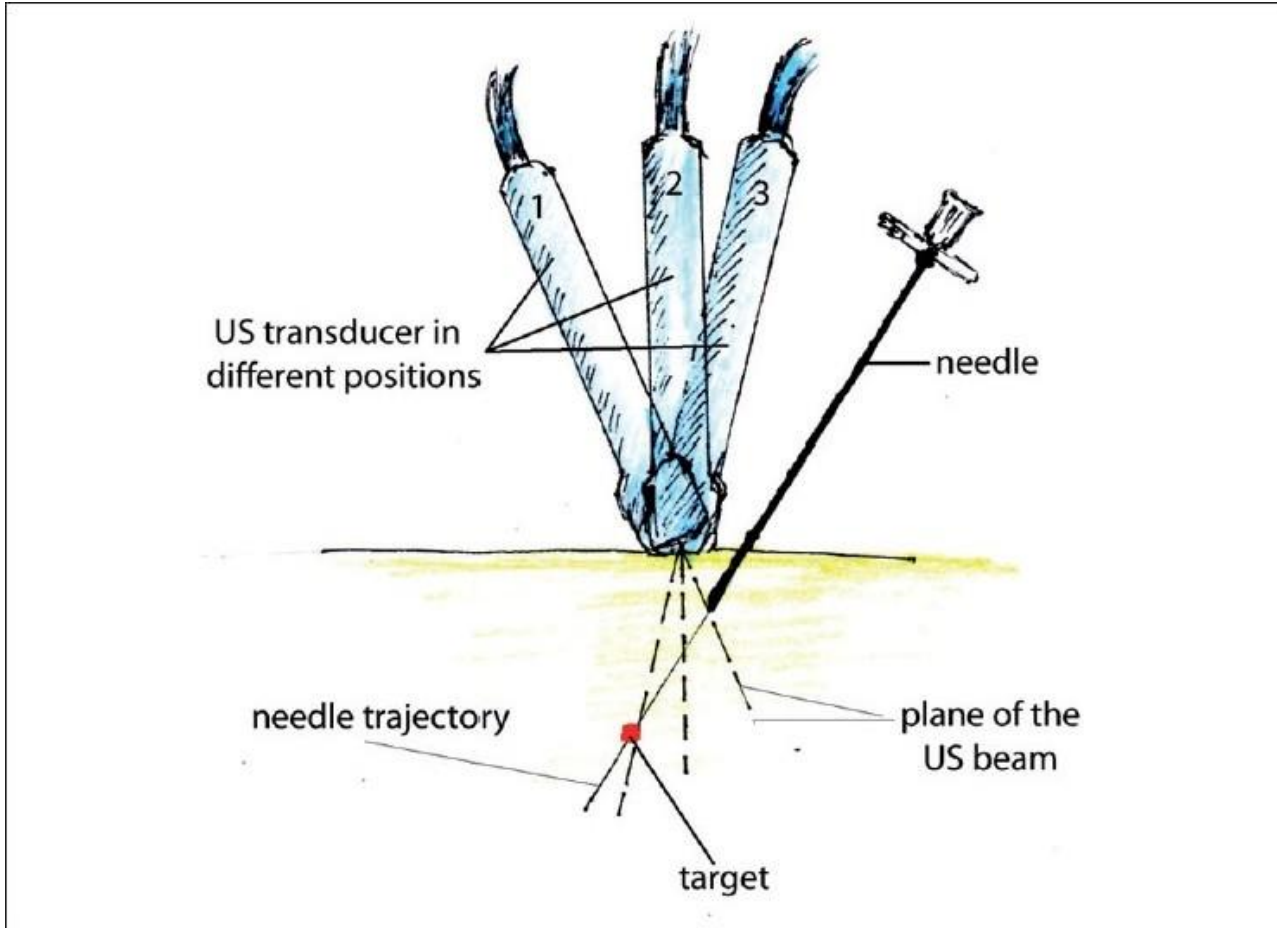


# Out of Plane -1-



A and B same distance if angle used is 45 degrees

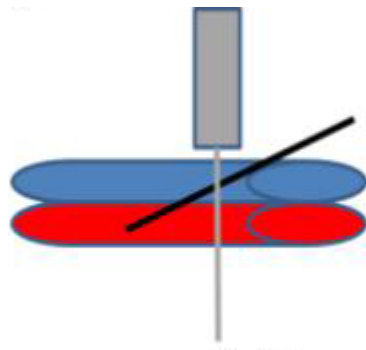
# Out of Plane -2-



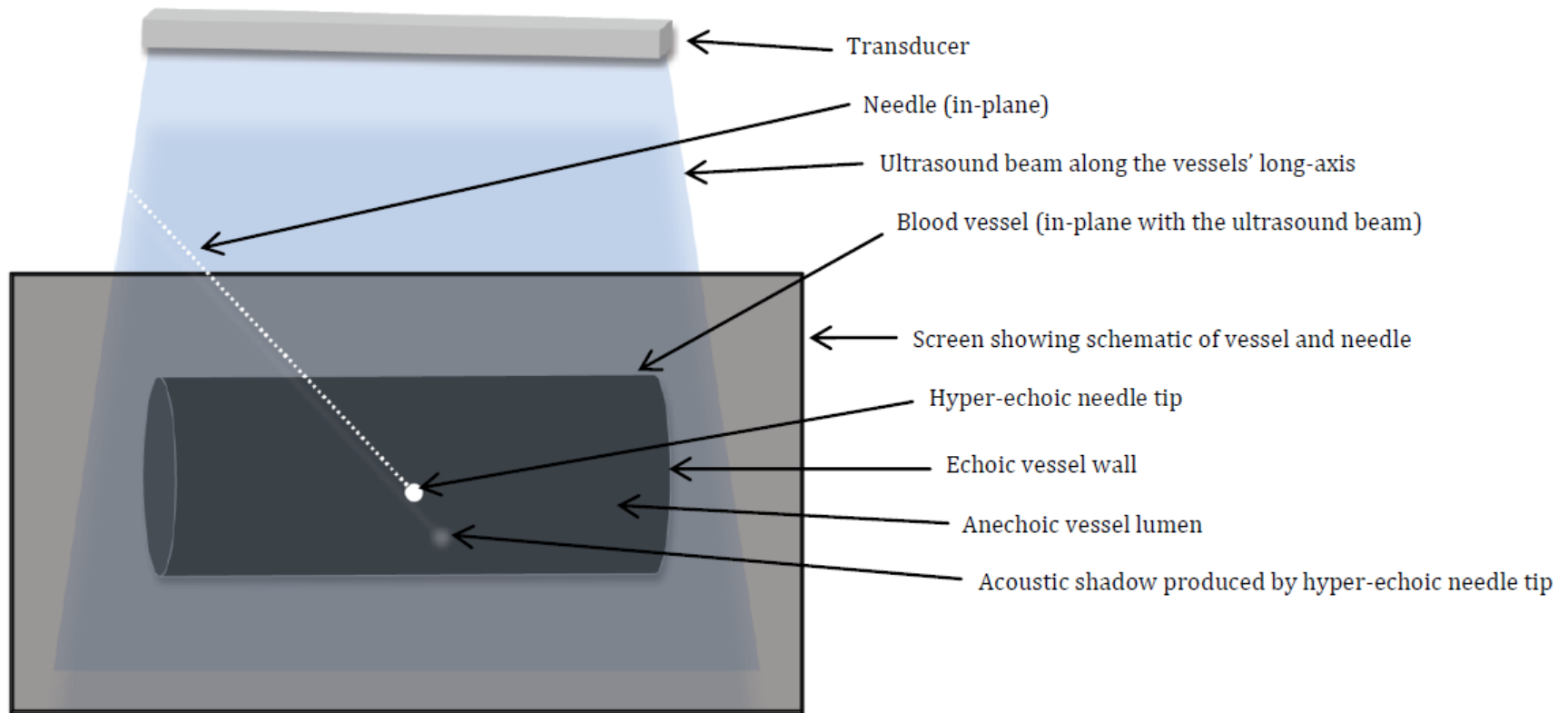
Follow the needle tip

## Out of Plane -3-

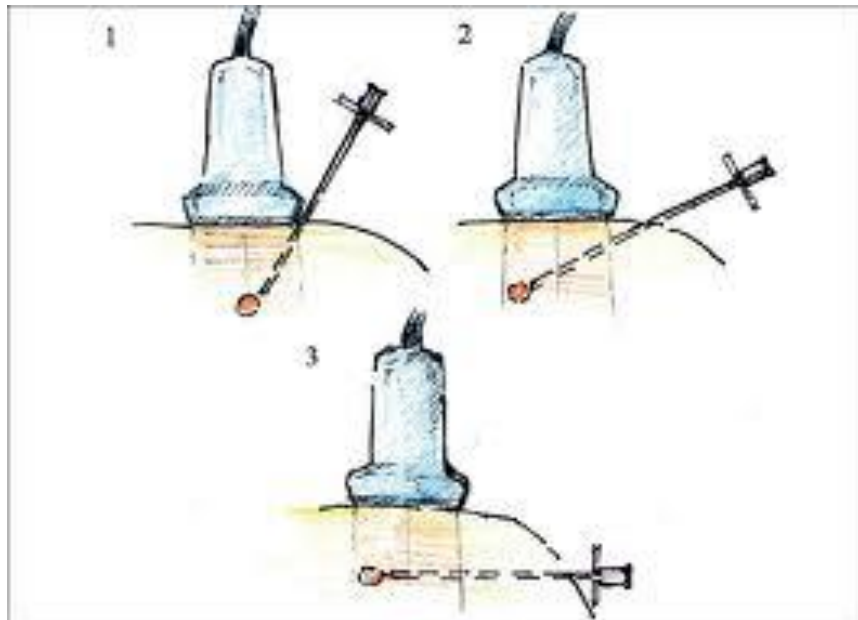
- Easier to start with
- Advantage: able to do when there is little space
- Disadvantage: if needle tip is not visualized, injury to nerves/vessels below target (we might only see needle shaft on USS)



# In plane



# In Plane -1-



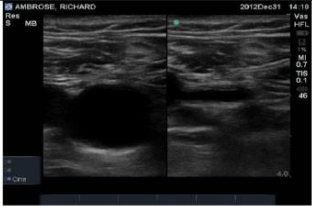
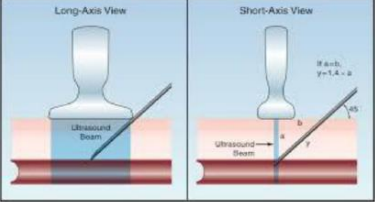
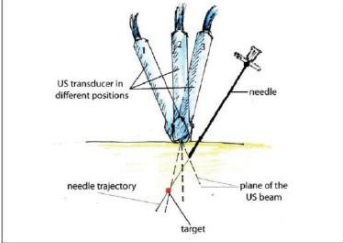
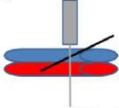
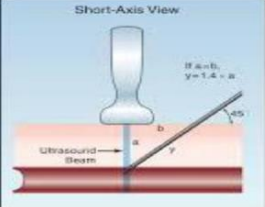


## In Plane -2-

- More difficult to start with
- USS beam 1mm thick
- Needle needs to go exactly in same plane as USS beam
- You need space for the probe and the needle (difficult in short necks)
- If artery/nerve straight next to it, high risk of injury (lateral movement of needle/USS beam)

## Minimum Dataset Vascular Access - FAMUS Scan

From the Society of Acute Medicine Ultrasound Working Group

Steps	Image	Explanatory Notes
Set up and prepare all your equipment		<ul style="list-style-type: none"> <li>• Tegaderm Dressing for Linear USS probe</li> <li>• Use <b>longer cannula</b> (at least 4 cm long)</li> <li>• Chloroprep</li> </ul>
Position USS device in line with limb		<ul style="list-style-type: none"> <li>• Consider device on opposite side of patient</li> <li>• You should be able to see Ultrasound screen and cannula at the same time</li> </ul>
Look for appropriate blood vessel		<ul style="list-style-type: none"> <li>• Veins are more oval and easily compressible</li> <li>• In elderly patients or low output states arteries might be compressible as well → compress slowly, arteries will be more pulsatile</li> <li>• Follow the vein with your ultrasound to understand course of vein for later insertion</li> </ul>
Decide on in plane / out of plane technique		<ul style="list-style-type: none"> <li>• In plane technique is better if vein and artery on top of each other, however vein need to be straight enough</li> <li>• Out of plane technique better when vein and artery next to each other</li> </ul>
<p><b>Use either:</b></p> <ul style="list-style-type: none"> <li>• Follow the needle approach</li> </ul>		<ul style="list-style-type: none"> <li>• Move transducer first, then follow with needle until needle tip appears on Ultrasound screen (always keep ultrasound ahead of needle to avoid needle tip injuring deeper structures (i.e. artery in picture below))</li> </ul>  <ul style="list-style-type: none"> <li>• Repeat these steps until blood vessel is reached</li> </ul>
<ul style="list-style-type: none"> <li>• 45 degree angle</li> </ul>		<ul style="list-style-type: none"> <li>• Depth of vessel (a) and insertion distance from ultrasound transducer (b) should be equal.</li> <li>• If an angle of 45 degrees is used, than needle should hit target</li> </ul>

The final steps are similar to cannula or central line insertion

QUESTIONS?

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