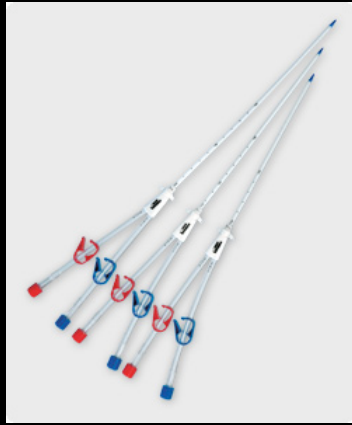


Vascular Catheters in Anaesthesia

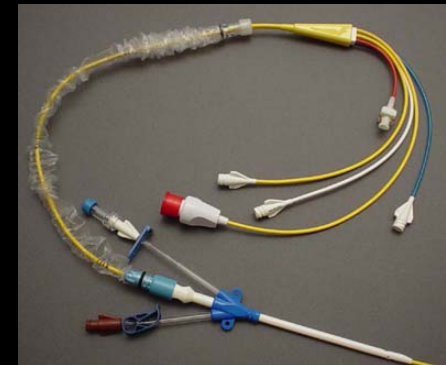
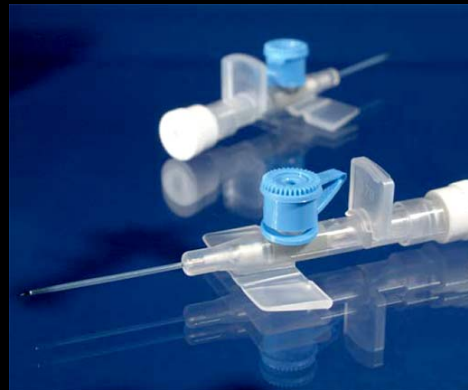
Timothy Aebi
UCHG July 2012

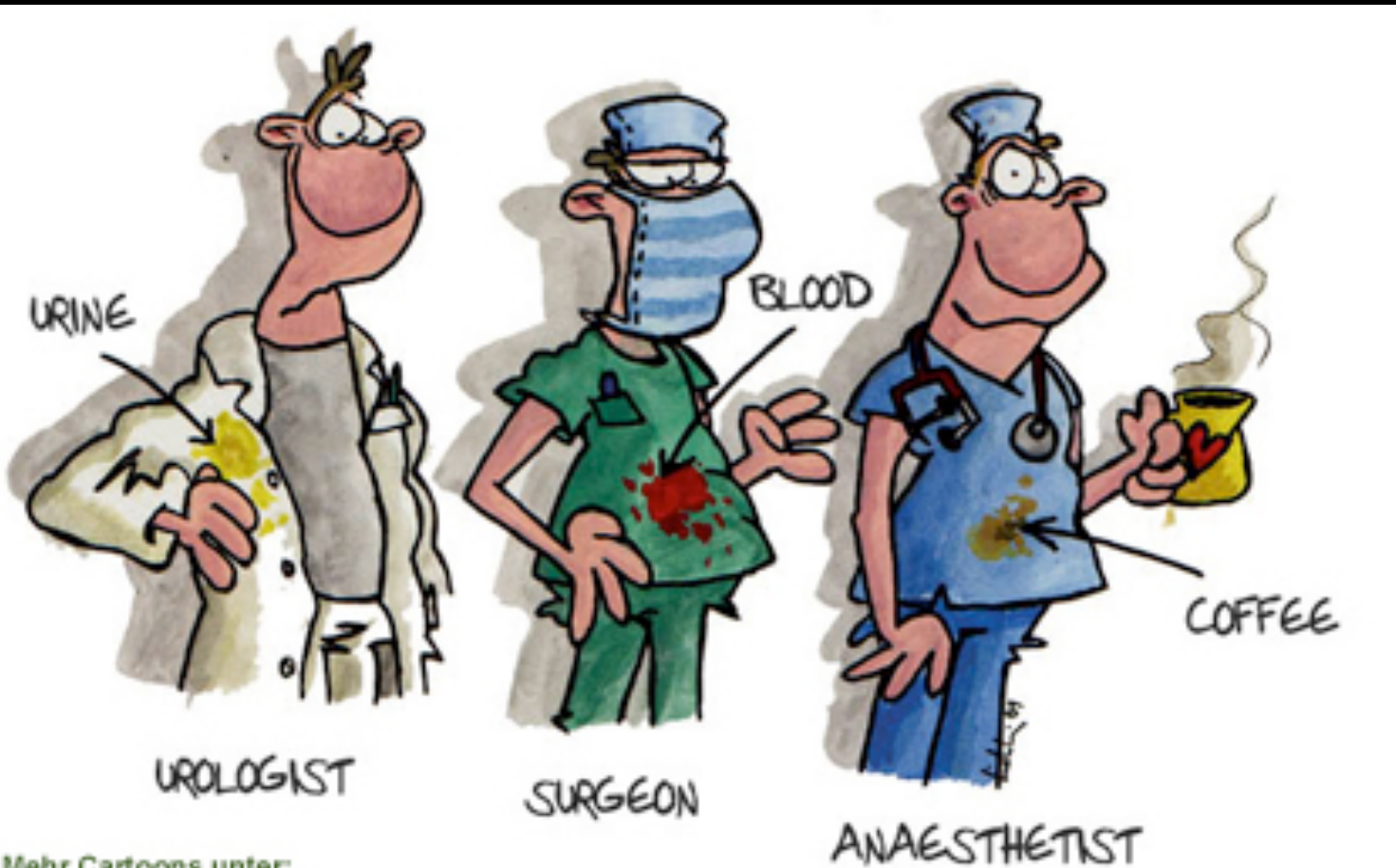


Catheters



?

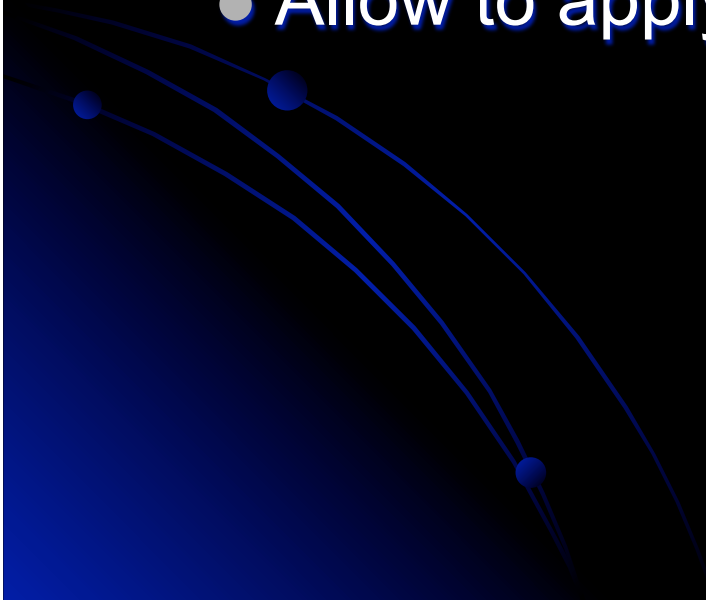




Mehr Cartoons unter:
www.rippenspreizer.com

IV-Cannulas

- Important properties
 - Easy to use and quick to put in
 - Easy to learn
 - No complications
 - Allow to apply drugs or volume required



Decisive factors



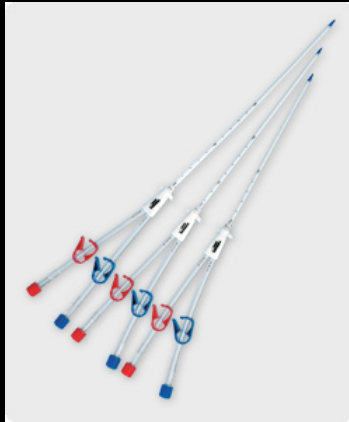
Decisive Factors

$$\text{Volume Flowrate} = \frac{\text{Pressure difference} \times \text{radius}^4}{\frac{8}{\pi} \text{ viscosity} \times \text{length}}$$

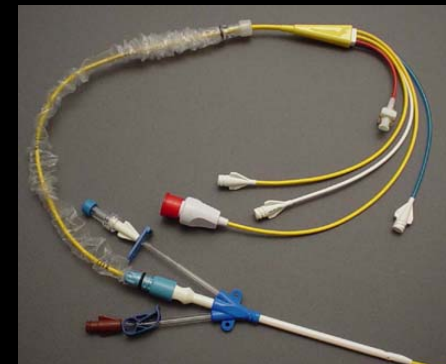
Law of Poiseuille



Zugangsart



?



Which to use



Peripheral IV-Cannulas

Colour	Gauge	Diameter mm	Length mm	Flow rate ml/min
Yellow	24	0.7	19	22
Blue	22	0.9	25	36
Pink	20	1.1	25	65
Green	18	1.3	33	103
White	17	1.5	45	128
Grey	16	1.7	50	196
Orange	14	2.2	50	343



Peripheral line



- 20G, Pink
- 1.1mm DM, 25mm Länge
- 65ml/min

- 14G, Orange
- 2.2mm DM, 50mm Länge
- 343ml/min

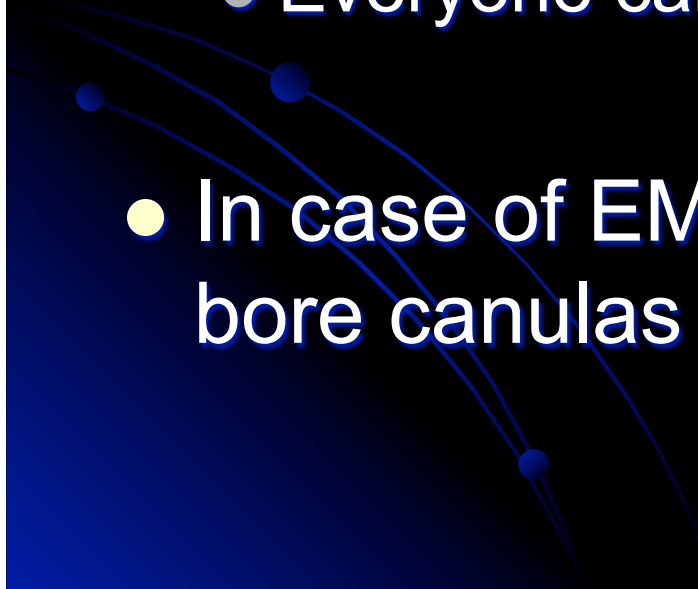
1000ml RL in
15.4min

1000ml RL in
2.9min

Level 1



Conclusion

- In case of volume resuscitation use primarily peripheral lines
 - Save and easy to use
 - Very few complications
 - Everyone can do them
 - In case of EMERGENCY always to large bore canulas
- 



Beware



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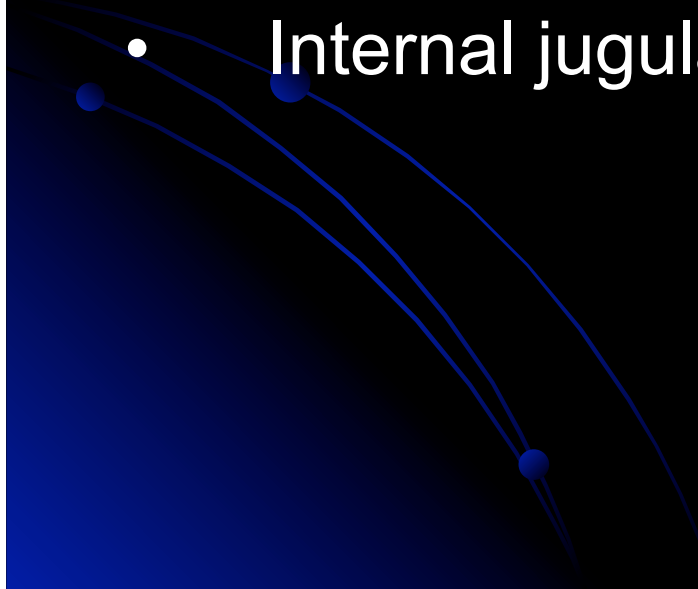


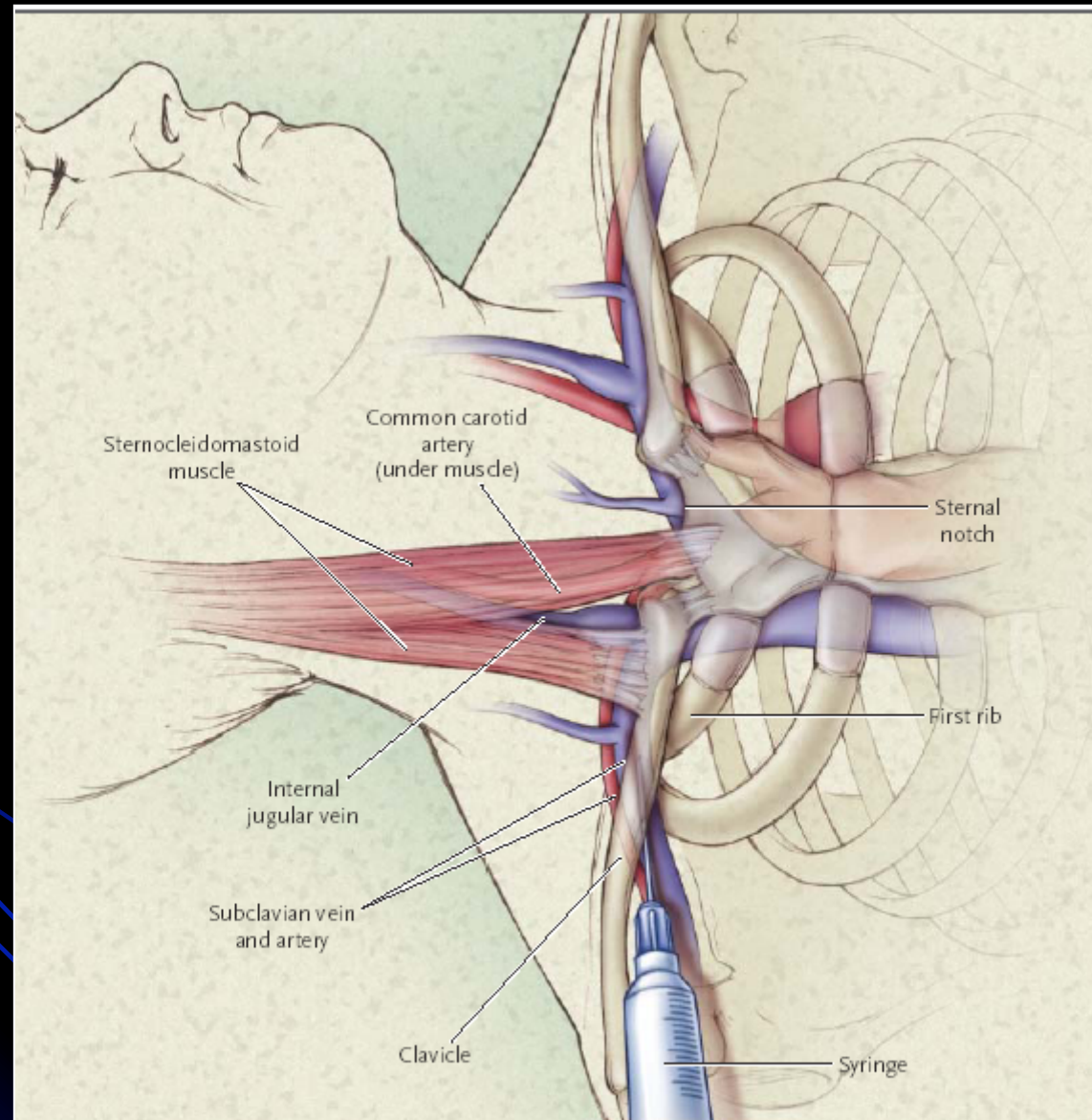
A CVC is no optimal line for volume resuscitation

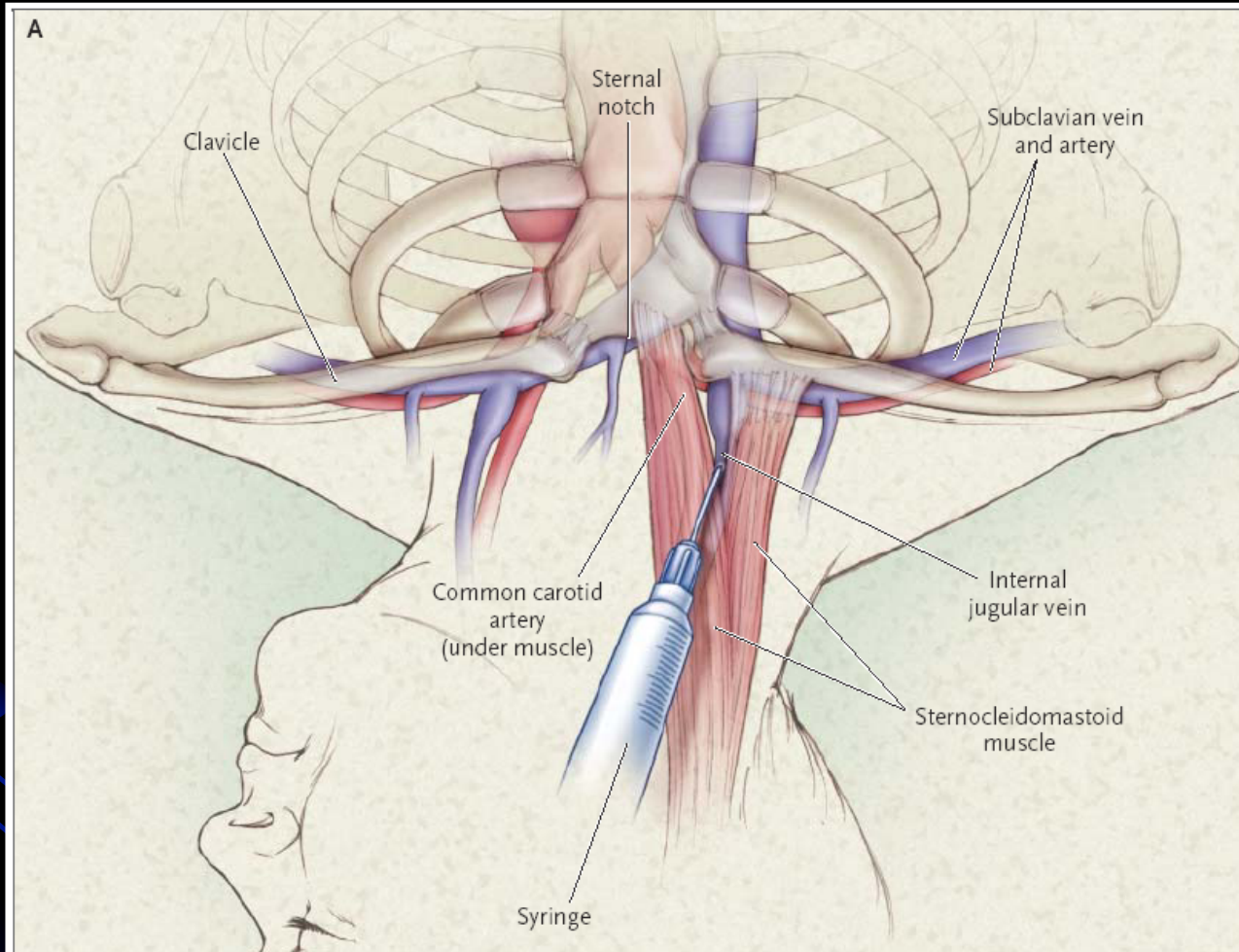
Central venous catheters

- Need specific indications
 - Medications (potassium, vasopressors, certain antibiotics etc.)
 - Measurements (CVP, PiCCO, Swan-Ganz etc.)
 - Total parenteral nutrition
 - Dialysis (Vascath)
 - Plasmapheresis
 - Impossible peripheral access

Puncture sites

- Basilic (arm) vein
 - Femoral vein
 - Subclavian vein
 - External jugular vein
 - Internal jugular vein
- 





Complications

- Pneumothorax
 - Experienced hands 1-3%
 - Incidence IJV > SCV
 - US guidance minimizes risk (National Institute of Health and Clinical Excellence, UK, recommends routine use)
 - Can occur/ increase over time!
 - Initial normal chest X-ray doesn't exclude pneumothorax to 100% !!!)

Complications

- Blood stream infections
 - Increase morbidity, deaths and health care costs significantly
 - Risk increases with number of lumens
- Venous Thrombosis
- Air embolism
- Hemorrhage
- Arrhythmias

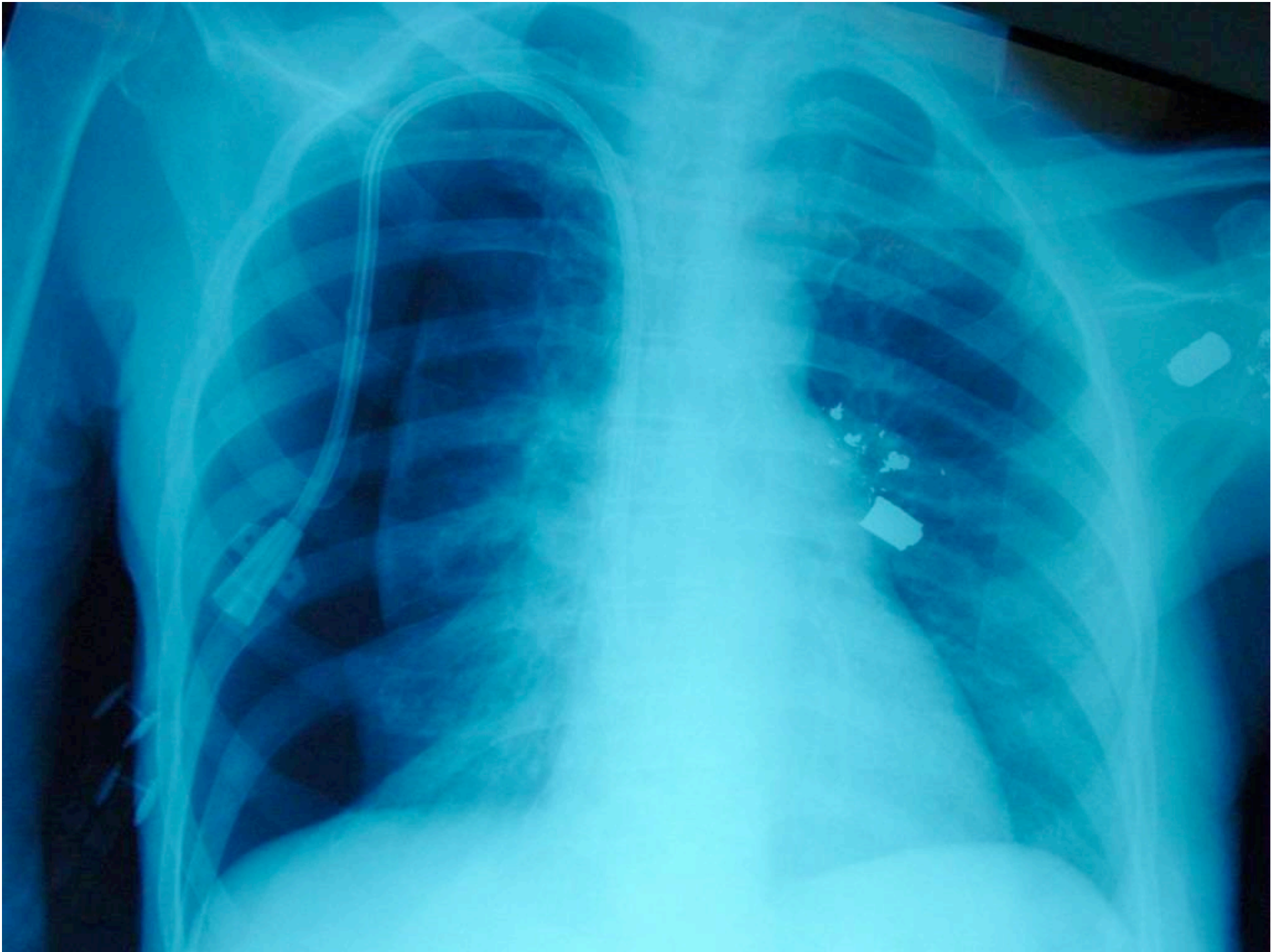


Table 2. Frequency of Mechanical Complications, According to the Route of Catheterization.*

Complication	Frequency		
	Internal Jugular	Subclavian <i>percent</i>	Femoral
Arterial puncture	6.3–9.4	3.1–4.9	9.0–15.0
Hematoma	<0.1–2.2	1.2–2.1	3.8–4.4
Hemothorax	NA	0.4–0.6	NA
Pneumothorax	<0.1–0.2	1.5–3.1	NA
Total	6.3–11.8	6.2–10.7	12.8–19.4

Mechanical

Recognize risk factors for difficult catheterization	A history of failed catheterization attempts or the need for catheterization at sites of prior surgery, skeletal deformity, or scarring suggests that catheterization may be difficult ⁴
Seek assistance from an experienced clinician	Insertion by a physician who has performed ≥ 50 catheterizations is half as likely to result in a mechanical complication as insertion of a catheter by a physician who has performed < 50 catheterizations ⁶
Avoid femoral venous catheterization	The frequency of mechanical complications with femoral catheterization is higher than with subclavian or internal jugular catheterization ^{3, 4, 22-24} ; the rates of serious complications are similar with the femoral and subclavian approaches ³
Use ultrasound guidance during internal jugular catheterization	The use of ultrasound guidance during internal jugular catheterization reduces the time required for insertion and reduces the rates of unsuccessful catheterization, carotid-artery puncture, and hematoma formation ^{25, 26}
Do not schedule routine catheter changes	Scheduled, routine replacement of catheters at new sites increases the risk of mechanical complications ^{19, 27}

Thrombotic

Insert the catheter at the subclavian site	Subclavian catheterization carries a lower risk of catheter-related thrombosis than femoral or internal jugular catheterization ^{3, 28}
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Type of Complication and Intervention	Rationale
Infectious	
Use antimicrobial-impregnated catheters	The use of antimicrobial-impregnated catheters reduces the risk of catheter-related bloodstream infections and reduces costs when the rate of catheter-related bloodstream infection >2% ⁹⁻¹¹
Insert catheters at the subclavian venous site	The risk of catheter-related infection is lower with subclavian catheterization than with internal jugular or femoral catheterization ^{5,9,12,13}
Use maximal sterile-barrier precautions during catheter insertion	Use of a mask, cap, sterile gown, sterile gloves, and large sterile drape reduces the rate of infections and reduces costs ¹⁴
Avoid the use of antibiotic ointments	The application of antibiotic ointments increases the rate of colonization by fungi, ¹⁵ promotes the development of antibiotic-resistant bacteria, ¹⁶ and has not been shown to affect the risk of catheter-related bloodstream infections ¹⁷
Disinfect catheter hubs	Catheter hubs are common sites of catheter contamination ¹⁸
Do not schedule routine catheter changes	Scheduled, routine replacement of central venous catheters at a new site does not reduce the risk of catheter-related bloodstream infection ^{19,20} ; scheduled, routine exchange of catheters over a guide wire is associated with a trend toward increased catheter-related infections ¹⁹
Remove catheters when they are no longer needed	The probability of colonization and catheter-related bloodstream infection increases over time ^{9,19,21}

Conclusion

- Use CVC's only when indicated
- Avoid too many lumens
 - Each lumen needs an indication
- Use full barrier protection
- Internal jugular vein best approach for most of our purposes
- Use the ultrasound
- Never do 'routine changes'
- Remove as soon as ever possible!

