

VASCULAR ACCESS

POISEUILLE'S LAW

Pressure Difference

Pressure bag → ↑ ΔP → ↑ infusion rates

Fluid Viscosity

↑ Fluid temp → ↓ viscosity → ↑ infusion rates

Catheter Radius

Most important factor
↑ catheter radius → ↑ infusion rates

Catheter Length

↓ catheter length → ↑ infusion rates
Large bore PIVs are shorter & infuse faster than a single port on a central line

$$Q = \frac{\Delta p \pi r^4}{8 \mu l} = \frac{\text{pressure difference} \times \pi \times \text{radius}^4}{8 \times \text{fluid viscosity} \times \text{length}} = \text{flow rate}$$

Peripheral IV (PIV) Access Type	Flow Rate (mL/min)	Time to infuse 1L (min)
24G 0.7mm x 3/4"	22	45
22G 0.9mm x 1"	35	29
20G 1.1mm x 1 1/4"	60	17
18G 1.3mm x 1 1/4"	105	10
16G 1.7mm x 1 1/4"	215	5
14G 2.2mm x 1 1/4"	350	3

French (Fr)	1	2	3	4	5	6	7	8	9
Outer Diameter (mm)	0.33	0.67	1	1.33	1.67	2	2.33	2.67	3

Gauge (G)	28	26	24	22	20	18	16	14	12
Outer Diameter (mm)	0.36	0.46	0.57	0.72	0.91	1.27	1.65	2.11	2.77

Quick Approximation

French	Gauge
2	~ 22
3	~ 20
4	~ 18
5	~ 16

French (Fr) size is in reference to the outside circumference of a cylindrical instrument (eg, catheters)

- French size = Diameter of the catheter (mm) x Pi
- French size varies directly with diameter (ie, the higher the Fr size, the bigger the diameter)

Gauge (G) size is in reference to the amount of needles that can fit inside a 1cm circle

- Eg, eighteen 18G needles can fit inside a circle with a diameter of 1cm
- Gauge size varies inversely with diameter (ie, the higher the gauge size, the smaller the diameter)