

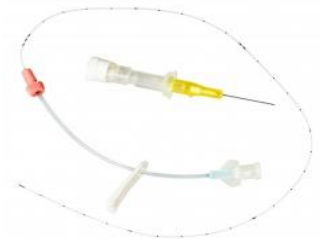
## 1 Fr PICC Lines: Special Consideration

A 1 Fr PICC line is often used for neonates and infants.

This line can be used for delivery of therapies in the same manner as other venous catheters terminating in the superior vena cava, or upper right atrium. The line is inserted by a qualified nurse or experienced physician. The line tip position must always be confirmed by a chest X-ray, which needs to be reviewed by a doctor.

1 Fr PICC lines have some special properties that need to be considered by anybody using these lines to avoid complications or premature removal.

- 1) It is very small line - only 0.35mm external diameter - which is a big advantage for small babies in avoiding thrombosis or infection.
- 2) As the material is fragile, the recommended syringe for flushing is **10mls or bigger**, so **never use 1, 2, or 5 mls syringe for flushing!**
- 3) **It is not possible to withdraw blood from a 1fr picc line and therefore this should not be attempted as a test of patency.**



### They are very difficult to flush by hand for the following reasons:

- a. The diameter is very small (0.35mm)
  - b. The line is very long (20-30cm)
  - c. The Syringe we are permitted to use is 10mls or bigger
- 4) A pump infusing through a 1Fr PICC may alarm for high pressure (see the reference below). The highest pressure recommended by the manufacturer is 750 mmHg, the maximum flow is 42ml/h. To avoid pump alarms (and possible line blockage as it is not flushing):
- a. Use the lower volume possible (mainly for short antibiotic infusions)
  - b. Use a smaller syringe (the pump generates controlled pressure, not like your hand), but usually 10- 20mls is adequate.
  - c. Use a lower infusion rate if possible (the pump might alarm even if the flow is below the recommended 42ml/h)
  - d. Call a Clinical Engineer to increase the pressure limit on the pump (up to 750mmHg).
- 5) As these lines are very small, they can get blocked very easily and very quickly. It means a 1Fr PICC needs to be flushed continuously.  
**So if a PICC line is not in use it needs to be continuously infusing heparin 1u/ml @ min rate 1ml/h, which needs to be started immediately.**
- 6) A Continuous heparin flush must be connected to the PICC line IMMEDIATELY after insertion even before the tip is confirmed on X ray.
- 7) Any difficulties relating to the line need to be discussed with the PICC line nurse (if available), or the anaesthetic team (bleep 8652 or 8528).
- 8) **No line is to be removed without consultant approval**

Other recommendations regarding sterility and maintenance for other vascular devices apply to a 1Fr PICC line as well

## Effect of length, flow rate and concentration of infusate on delivery pressures in 1Fr Neonatal PICC lines.

*W.B. D'Costa, M. Goggin, G.J. Richards, Neonatal Unit, St. George's Healthcare NHS Trust, London, UK*

### Background / Aims

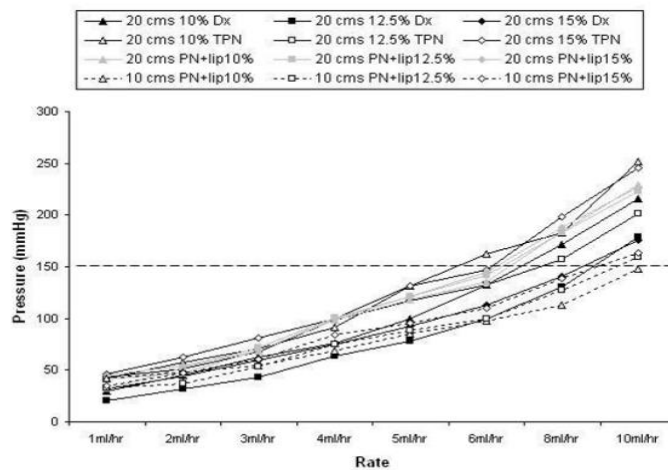
Neonatal infusion pumps are pressure limited. On our NICU, normally functioning 1Fr lines frequently exceed maximum pressure limits, and are either removed or flow rates reduced. We aimed to measure pressures in neonatal PICC lines with varying flow rates and to determine the effect of reduction in length of catheter.

### Methods

We infused increasing concentrations of dextrose and TPN ± lipid through standard 20cm length 1Fr (Premicath, Vygon) and 30cm 2Fr (Nutraline, Vygon) PICC lines at different rates from 1-10ml/hr. Premicath lines with and without stylet were tested at lengths of 20cm and 10cm. Flow pressure relationships were determined using pressure monitoring infusion pumps (IVAC).

### Results

Pressures generated in the 2Fr neonatal lines were significantly lower than those generated through 1Fr neonatal Premicath lines. Pressure recordings were similar between Premicath lines with and without stylet. Reduction in catheter length did produce a reduction in pressures generated especially at higher flow rates. Pressures exceeded the standard pressure limit on our unit (150mmHg) at flow rates of approximately 6ml/hr



*Flow Pressure Graph for 1Fr PICC lines*

### Conclusions

1 Fr lines generated far greater pressures than 2Fr lines to achieve the same flow rate, as predicted from Poiseuille's Law -  $Flow \propto \frac{(Pressure \times Radius^4)}{(Viscosity \times Length)}$ .

Reduction in length allowed higher flow rates before pressure limits were reached. Increasing pressure limits above 150mmHg, or reducing line length are the only options available to allow use of these lines at higher flow rates.