

Factors improving intravenous fluid flow rate for rapid resuscitation, based on the hagen-poiseuille law

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Primary approach to resuscitating volume-depleted, critical patients, requires the swift establishment of 2 large-bore peripheral intravenous catheters (PIVC) over a central venous catheter (CVC); due to its ability to achieve faster fluid delivery. The PIVC's faster flow rate compared to the CVC is explained by the Hagen-Poiseuille Law, whereby doubling the radius can increase flow 16-fold and halving the length can double the flow.

We applied the same law to study the optimal intravenous (I.V) tubing system dimensions, studying the tubing internal diameters (I.D) of 3mm, 4mm and 5mm and lengths of 150cm, 90cm and 30cm. The 4mm I.D tube achieved the highest flow rates under both gravity and manual saline bag compression, with a p-value of 0.009. However, despite the Hagen-Poiseuille Law favoring shorter lengths, the 30cm length resulted in the slowest flow rates. As emphasis is held on the importance of circulation in rapid resuscitation, ideal I.V tubing dimensions specifically designed for volume-depleted patients need to be sought.