Table 5.19 Parenteral nutrition access routes (adapted from Pittiruti *et al*. 2009; Loveday *et al*. 2014; Pironi *et al*. 2016).

Access Route	Insertion	Contraindications	Considerations
Peripheral Route Cannula.	The cannula is usually inserted into the veins of the forearm or hand and needs to be re-sited regularly i.e. use 12 hourly cyclical infusions, removing the cannula post infusion and replacing in the other arm (Anderson *et al*. 2003). Access the largest peripheral vein available using a small cannula (18-20FG), covered with a sterile dressing.	Requires adequate peripheral access. Patients with higher nutritional requirements.	Reduced insertion complications compared with central PN. Can be placed on the ward, using a strict aseptic technique. Short duration, normally 7-10 days. The osmolality of the PN regimen needs to be reduced to < 850mosm/L, which will limit the glucose, and potassium electrolyte content. A greater proportion of total energy needs to be provided as lipid. Risk of peripheral vein thrombosis (thrombophlebitis). If the vein occludes, extravasation of the infusion into the surrounding tissues may occur.
Peripheral Route Mid Line - fine bore (22-23FG), 10-15cm in length.	Line is inserted via the antecubital fossa into the proximal basilic or cephalic veins. Access the largest peripheral vein available using a small cannula (18-20FG), covered with a sterile dressing.	Requires adequate peripheral access. Patients with higher nutritional requirements.	Reduced insertion complications compared with central PN. Requires adequate peripheral access. Positional factors may cause occlusion. Recommended duration 1-4 weeks. Does not enter the central veins. The osmolality of the PN regimen needs to be reduced to < 850mosm/l, which will limit the glucose, and potassium electrolyte content. A greater proportion of total energy needs to be provided as lipid.
Central Route Peripheral inserted central catheter (PICC). 50 – 60cm long.	Insertion via basilic or cephalic veins of the antecubital fossa with the tip lying in the superior vena cava.	Placement may not be possible in the presence of oedema, anatomical distortion following trauma, pre-existing skin infection or uncorrected coagulopathy.	Needs to be placed by a trained and skilled professional. Advantages – reduces risk associated with central venous catheters e.g. pneumothorax, haemothorax. Provides dedicated venous access throughout the feeding period. Recommended duration 4 weeks to 6 months. Can limit limb movement at insertion site.

Table 5.19. Parenteral nutrition access routes (continued) (adapted from Pittiruti *et al*. 2009; Loveday *et al*. 2014; Pironi *et al*. 2016).

Access Route	Insertion	Contraindications	Considerations
Central Route Multi-lumen, non-tunnelled central venous catheter (CVC).	Access via subclavian, jugular or femoral veins, with the tip placed to lie in the superior vena cava (subclavian and jugular approach) or inferior vena cava (femoral approach).	As per PICC.	The insertion of all central venous catheters (CVC) are associated with greater risks than peripherally inserted catheters. All devices should be inserted in optimum sterile conditions by trained personnel. A single lumen should be dedicated for PN only (but all other lumens must be handled with the same meticulous attention to aseptic technique). Higher incidence of catheter related blood stream infection compared with single lumen lines. Jugular lines are easy to insert but due to positioning, can be uncomfortable for the patient and difficult to dress. Femoral lines may increase risk of infection due to anatomical position.
Central Route Single Lumen, non-tunnelled CVC.	Access via subclavian, jugular or femoral veins, with the tip placed to lie in the superior vena cava (subclavian and jugular approach) or inferior vena cava (femoral approach).	As above.	Reduced infectious complications compared with multi-lumen lines.
Central Route Cuffed single lumen line (Hickman, Broviac).	Usually inserted into the subclavian vein. The catheter exits onto the chest wall via a skin tunnel.	As above.	Used for long-term feeding (more than 30 days, months, years). Tunnel reduces infection risk. Dacron cuff secures line in place. Easy to dress.
Central Route Implanted Port (Portacath).	A subcutaneous port is tunnelled under the skin and is accessed using a needle. Usually placed in the chest or upper arm.	Not suitable for needle phobic patients as the skin needs to be punctured every time the device is accessed.	When port is not accessed the device is under the skin so cannot be pulled out. Long term use of months / years.