Complications of Parenteral Nutrition (PN)

ESPGHAN

Complications can be reduced and quality of life improved by:

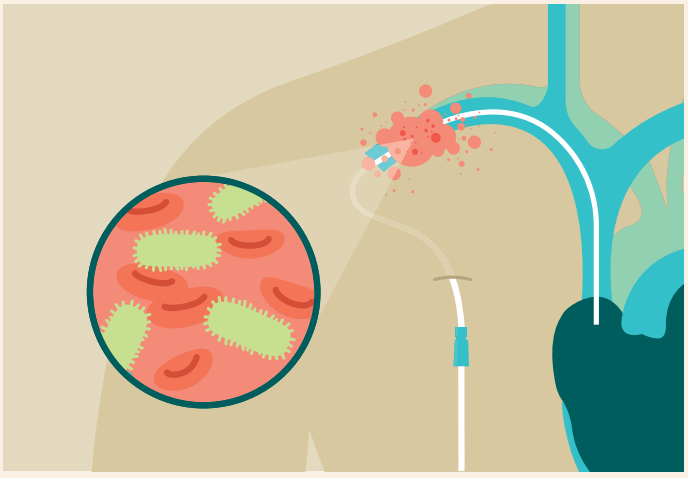
- Using existing evidence-based guidelines
- Limiting the number of infusions/week, if possible
- Limiting hours of PN to a minimum – aiming for no more than 10-12hrs
- Replacement of excessive fluid losses in PN if at all possible
- Use of portable pumps
- Care as close to home as possible

Catheter-related bloodstream infection (CRBSI) diagnosis

- Any child with intestinal failure (IF) and a central venous catheter (CVC) is at significant risk of CRBSI. Any fever (temperature >38.5 or rise >1°C), or change in clinical or laboratory parameters should raise the suspicion of CRBSI until proven otherwise
- Paired quantitative blood cultures taken simultaneously from both the CVC and a peripheral vein should ideally be obtained when a CRBSI is suspected and before the start of antibiotic therapy
- To confirm CRBSI without catheter removal, calculate the differential time (difference in time to positivity between central and peripheral blood withdrawal) between blood cultures drawn from the catheter and from a peripheral vein or separate lumen

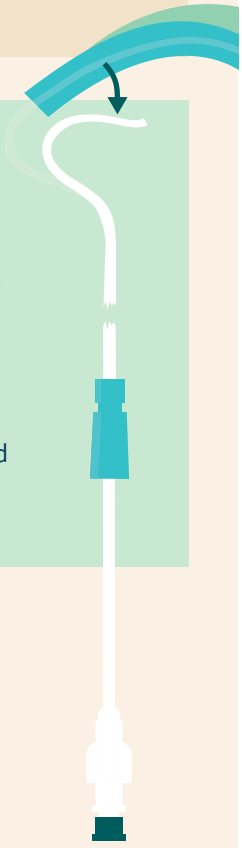
CRBSI therapy

- Empirical antibiotic therapy including coverage for grampositive coagulase-negative or positive staphylococci and gramnegative bacilli
- The duration is generally 10-14 days, assuming clinical and microbiological response within 48-72h and no evidence of complications
- Removal of the CVC only if clinical deterioration or persisting or relapsing bacteremia.



Complications with Catheters

- Investigate immediately when catheter breakage or fluid extravasation are suspected
- Educate users about correct maintenance and safety of the catheter



Interventions to decrease thrombotic complications and CVC occlusion

- Routine use of heparin cannot be recommended over use of saline flush
- For CVC that are being accessed intermittently, flushing with 5-10 U/mL heparinized saline 1-2 times weekly helps maintain patency
- Recombinant tissue plasminogen activator or urokinase should be used to unblock a catheter
- There is insufficient evidence to advocate the prophylactic use of anticoagulants

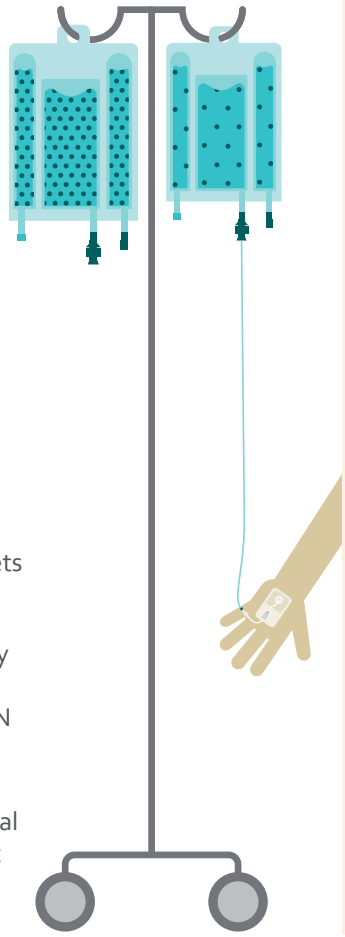
Complications and considerations related to the composition of PN solution

Stability

- PN should be administered wherever possible using an admixture formulation validated by a licensed manufacturer or suitably qualified institution
- A matrix table should be sought from the supplier of the formulation detailing permissible limits for additions of electrolytes and other additives
- Alternative ingredients should not be substituted without expert advice or repeat validation
- Phosphate should be added in an organic-bound form to prevent the risk of calcium-phosphate precipitation
- If inorganic phosphate is used, stability matrices and order of mixing must be strictly adhered to
- When '2 in 1' admixtures with Y-site lipids added are used, addition of lipids should be fully validated by the manufacturer or accredited laboratory or the lipid infused through an alternative line

Drug compatibility

Mixing of medications with PN in administration lines should be avoided unless validated by the manufacturer or accredited laboratory



Peroxidation, light protection and vitamin stability

- Multi-layer bags which are impermeable to oxygen are recommended for PN administration
- Light/sun protection is recommended for both PN bags and administration sets

Osmolarity

- The recommended delivery site for PN is via a central line; however peripheral PN can also be given for short periods
- The osmolarity of peripheral PN solution should be kept at less than 900 mosmol/l

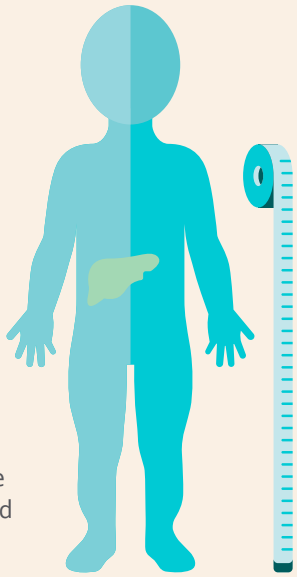
Metabolic complications of PN

Metabolic bone disease

- In children on home PN, regular measurements of urinary calcium, plasma calcium, phosphorus, parathyroid hormone and 25-OH vitamin D concentrations and serum alkaline phosphatase activity should be taken
- Ingredients with the lowest amount of aluminum are advocated for the preparation of PN solutions provided to patients receiving PN
- Regular assessment of bone mineralization should be performed

Growth retardation

Paediatric patients on long term PN require regular monitoring of growth and body composition



Hepatobiliary complications

- In patients with intestinal failure-associated liver disease (IFALD), maximise enteral intake, as tolerated enteral nutrition may improve liver disease outcome
- In patients on long-term and home PN, cycling of PN infusion is recommended as soon as metabolic and fluid status allows
- Pure soybean-based lipid emulsions (LEs) should be avoided in the presence of cholestasis
- The use of mixed LEs may be encouraged in IFALD patients for long term PN
- The initiation of ursodeoxycholic acid may be considered in the presence of biochemical signs of cholestasis
- Early referral to an experienced paediatric intestinal failure rehabilitation/transplantation centre is recommended in infants/children with IFALD

Section Reference: Full references for the advice within this section can be found within the following paper, which this section is based upon: Hartman C, Shamir R, Simchowitz V, Lohner S, Cai W, Decsi T; ESPGHAN/ESPEN/ESPR/CSPEN working group on pediatric parenteral nutrition. ESPGHAN/ESPEN/ESPR guidelines on pediatric parenteral nutrition: Complications. Clin Nutr. 2018 Jun 28. pii: S0261-5614(18)31175-0.