

Prescribing Multi-Chamber Bags for Parenteral Support Regimens

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Commercially available, licensed, multi-chamber bags (MCBs) are increasingly used in home parenteral support (HPS) regimens in line with the Medicines and Healthcare Products Regulatory Authority and the Royal Pharmaceutical Society guidance. This will aid optimisation of aseptic capacity, given the predicted increase in demand (Lord Carter 2020 review of Pharmacy aseptic services in England). MCBs can be safely incorporated into HPS regimens, either as solely MCB +/- intravenous fluids, or alongside compounded parenteral nutrition bags as a 'hybrid' regimen.

Key points

1. A detailed history, including medications, gastrointestinal anatomy and co-morbidity should be recorded in order to allow predictions about nutritional and electrolyte requirements.
2. In line with regulatory guidance all patients receiving HPS should be considered for a licensed, non-compounded regimen, before consideration is given to using a hybrid model (a combination of non-compounded and compounded HPS) or, as a final option, a fully compounded (bespoke) HPS regimen.
3. To meet the needs of an individual patient, the regimen may require additional intravenous fluids with or without electrolytes.
4. MCBs are available in both triple-chamber (nitrogen, glucose, and lipid) and double-chamber (omitting the lipid) bags. However, double-chamber options are limited within the UK. Electrolyte-free versions are available in some product ranges.
5. Consideration needs to be given to the lipid source and amount, since it may be necessary to limit the number of triple-chamber MCBs in long-term non-compounded HPS regimens to once or twice weekly.
6. As an MCB or intravenous fluid regimen does not contain micronutrients (vitamins and some minerals), the micronutrients may need to be given orally, orally, intravenously or as a separate infusion.

7. Consideration should be given to the practicalities and patient/carer training needs of administering multiple infusions. Patients keeping a weekly diary of their regimen can mitigate risks.
8. The formulation and prescription templates available as part of the Home Parenteral Nutrition Framework should be utilised to ensure standardisation and consistency across all Integrated Severe Intestinal Failure and Home Parenteral Nutrition Centres and Homecare Providers.
9. For all HPS regimens, patients should have buffer bags and/or intravenous fluids in their home in case of emergency.

Explanations

1. Knowledge of the remaining gut anatomy should allow the enteral route to be fully optimised wherever possible, and predictions about medication and micronutrient absorption to be made. Consideration should be given to distal feeding or chyme reinfusion if appropriate.
2. Where possible it is always advisable to use licensed medicinal products ahead of unlicensed options unless there is a clear special clinical need. In line with the UK Medicines Regulatory Framework, all patients should be considered firstly for entirely non-compounded HPS regimens. When a patient's nutritional needs cannot be provided using a regimen consisting entirely of MCB and/or intravenous fluids, the use a combination of MCBs with compounded PN ('hybrid' regimen) should be considered before using a fully compounded (bespoke) regimen. The flexibility of utilising some compounded bags within the regimen may allow for a patient's weekly needs, especially of micronutrients, to be met.

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3. When assessing for suitability of including MCBs into an HPS regimen, it is often easier to consider the macronutrient and electrolyte needs of the patient as a weekly total. In devising a HPS regimen, an assessment needs to be made about whether the patient can tolerate daily fluctuations in fluid and/or electrolytes in their regimen.
4. Both triple-chamber and double-chamber MCBs may be used to meet an individual's macronutrient requirements (particularly lipid) to reduce the risk of intestinal failure associated liver disease (IFALD). Electrolyte free preparations (including of MCBs) occasionally may be given to patients with very specific electrolyte needs.
5. Where possible mixed lipid emulsions should be used, and solely soybean-based lipid emulsions (which may be associated with abnormal liver function tests) avoided. The lipid content of the HPS regimen ideally should remain below 1 g/kg/day whilst ensuring that excessive glucose calories are not given.
6. Due to the lack of micronutrients within commercially available MCBs, there needs to be consideration of how patients receive adequate supplementation. This can be done orally via multivitamin and trace element preparations such as Forceval[®] (also available on the national home parenteral nutrition (HPN) framework in the soluble and capsule formulations). Generally, water soluble vitamins taken orally should be absorbed even with a very short bowel, however lipid soluble ones may not. If there is a colon in continuity then some vitamins (e.g. thiamine, riboflavin, biotin, pantothenic acid, folate and vitamin K) can be manufactured in variable amounts by colonic bacteria. If the patient is unable or unlikely to absorb oral medication then intravenous multivitamin and trace element infusions can also be used alongside MCBs for up to 7 nights a week, depending on the patient's needs (determined by routine monitoring).
7. During the last few years when there has been a substantial use of MCBs for HPS across the country, no evidence has emerged that patients requiring multiple infusions as part of their parenteral support (or who use double/triple-infusion sets) are at increased risk of catheter-related blood stream infection, despite increased connections to the central venous catheter. The use of MCBs has allowed the continued expansion of HPN to the increasing numbers of patients who need it. The national database and audits

allow continued monitoring of infection rates across all HPS patients. Manufacturers hold limited data on y-site infusions of fluids; therefore, they should be contacted for advice regarding the compatibility of specific regimens. The running of MCBs alongside intravenous fluids is unlicensed, so this data is only available upon individual request.

As the regimens containing multiple infusions can become very complex (e.g. different MCBs and intravenous fluids on different days), a HPS weekly diary of their regimen may give clarity to the patient/carers, and consideration is required about who is managing the patient's HPS regimen. Where possible, all patients should be encouraged to train to be self-caring, or have a carer nominated to train. This may depend upon who has the best manual dexterity, know-how and strength to break the seals on an MCB to allow mixing prior to an infusion. Care must be taken if using electrolyte free and electrolyte containing MCBs. It must be ensured that patient/carers can recognise the difference between the two (visual aids may help).

Not all pumps on the Home Parenteral Nutrition Framework have multi-spike giving sets that permit more than one infusion to be given at the same time, so it may be necessary to switch the pump the patient uses. Other options for multiple infusions to run concurrently include:

- Using a double lumen catheter with 2 pumps
 - Adding a double lumen IV extension to a single lumen catheter with 2 pumps
 - Using a dual channel pump with the infusions being attached to either a double lumen device, or a single lumen device with a double lumen IV extension set added.
8. Formulation request templates are available for all forms of HPS regimens and should be used to ensure standardisation of practice. Advice on how to correctly fill out these requests is available in the suggested reading below.
 9. All patients should have a supply of buffer bags and/or intravenous fluids available at home for use in emergency situations. The stock of buffer bags should be reviewed every time there is a change to the HPS regimen. Patients should be counselled on when and how to use these and be provided with written instructions.

Suggested reading:

- Sharkey L and the BIFA committee (2022). BAPEN/BIFA guidelines on the Diagnosis and Management of Intestinal Failure Associated Liver Disease (IFALD). Available online: www.bapen.org.uk/pdfs/bifa/bifa-ifald-guidelines.pdf (Dec 2022).
- Mercer-Smith G, Kirk C, Gemmill L, Mountford C, Nightingale J, Thompson N and the BIFA committee (2021). Haematological and Biochemical Monitoring of Adult Patients receiving Home Parenteral Nutrition. Available online: www.bapen.org.uk/pdfs/bifa/position-statements/position-statement-haematological-biochemical-monitoring-adult-hpn.pdf (Dec 2022)
- Crooks B, *et al.* (2022). Catheter-related infection rates in patients receiving customized home parenteral nutrition compared with multichamber bags. *J Parenter Enteral Nutr.*; 46: 254-257.
- Harrison, S, *et al.* (2022). Hybrid model of compounded and multichamber bag parenteral nutrition for adults with chronic intestinal failure. *J Parenter Enteral Nutr.*; 46: 1632-1638.
- Future NHS (2022). NHS England home parenteral nutrition clinical advice and management group. Home Parenteral Support (Home Parenteral Nutrition [HPN] and/or Home Parenteral Fluid and Electrolytes [HPE]). Prescriptions for patients with Intestinal Failure: Assessing for non-compounded/hybrid regimens and completion of the formulation template. Available online: <https://future.nhs.uk/homePN/view?objectId=137178277> (Dec 2022).
- Pironi L, *et al.* (2020). Home parenteral nutrition provision modalities for chronic intestinal failure in adult patients: An international survey. *Clin Nutr.*; 39 (2): 585-591.
- GOV.UK (2014). The supply of unlicensed medicinal products 'specials', MHRA guidance note 14. The Medicines and Healthcare Products Regulatory Authority. Available online: www.gov.uk/government/publications/supply-unlicensed-medicinal-products-specials (Dec 2022).
- Department of Health and Social Care by Lord Carter of Coles (2020). Transforming NHS Pharmacy Aseptic Services in England. Available online: <https://shbn.org.uk/wp-content/uploads/2021/02/Transforming-NHS-pharmacy-aseptic-services-in-England.pdf> (Dec 2022).