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ISMP Institute for Safe Medication Practices
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Educating the Healthcare Community About Safe Medication Practices

MCB-PN—specialized therapy calls for strong systems and specialized expertise

Compared to patient-specific custom-compounded parenteral nutrition (PN), commercial multi-chamber bag parenteral nutrition (MCB-PN) offers a streamlined approach for delivering essential nutrients to patients who cannot tolerate oral or enteral feeding. In the United States, MCB-PN products are available in two- or three-chamber bags. The two-chamber products include one chamber containing dextrose, with or without calcium, and the other containing amino acids, with or without electrolytes. The three-chamber products contain separate chambers of dextrose, amino acids and electrolytes, and intravenous lipid emulsion (ILE). MCB-PN products are available in different volumes and concentrations of macronutrients. When using MCB-PN, practitioners should choose the MCB-PN product that requires the least amount of manipulation to meet the patient's nutrient requirements.

MCB-PN is designed to simplify preparation and reduce prescribing and compounding errors compared to custom-compounded PN. Advantages include cost savings, reduced pharmacy preparation time, less manipulation, reduced infection risks, and availability of PN during times of macronutrient or additive shortages and for emergency preparedness.[1-4] Despite these benefits, MCB-PN presents unique safety challenges requiring careful consideration across the PN-use process to optimize patient outcomes and minimize risks. MCB-PN-related errors reported to ISMP range from improper activation (not breaking the seal[s] between chambers), mix-ups among the various MCB-PN formulations, failure to include required additives (e.g., multivitamins and trace elements), and infusing MCB-PN bags beyond the maximum recommended duration (i.e., 24 hours).

MCB-PN Errors May Be Hard to Spot

Similar to any PN formulation, MCB-PN is considered a high-alert medication that is susceptible to errors that can result in significant patient harm. Depending on the situation, practitioners may easily be able to identify a dose that could cause a catastrophic error with some high-alert medications. For example, most would be able to recognize that an order for 10 mg digoxin intravenously (IV) represents a significant overdose. However, practitioners may be less familiar with the appropriate macronutrient and micronutrient amounts that are needed to meet the patient's nutrient needs, and errors may be less obvious. For example, without clinical decision support, not all practitioners may easily detect if too much calcium or phosphorus was added to an MCB-PN product that already contains these electrolytes. Due to the complexity of MCB-PN orders, practitioners need to be knowledgeable about available formulations and how to calculate that the prescribed preparation is safe and appropriate for the patient.

A recent ISMP survey[5] revealed that nearly one-third of respondents had experienced or were aware of MCB-PN-related errors, yet most (66%) indicated that their organizations lacked competency assessments for staff managing these products. These findings highlight the need for robust safeguards, clear processes, and ongoing practitioner training to ensure patient safety when using MCB-PN.

Consensus-Building National Stakeholder Meeting

In September 2025, clinical experts from around the United States were invited to attend an MCB-PN stakeholder meeting, led by ISMP and the American Society for Parenteral and Enteral Nutrition (ASPEN), to discuss priority MCB-PN-related safety topics. The goal of the stakeholder

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"DOUBLE STRENGTH" labeling on esmolol may lead to confusion. A pharmacist reported concerns with the labeling of esmolol 2,000 mg/100 mL premixed bags made by WG Critical Care. The label states, "Esmolol Hydrochloride in Sodium Chloride Injection DOUBLE STRENGTH" in green font with the concentration to the right (**Figure 1**). However, there is no approved standard concentration upon which "double strength" of esmolol injection should be based. This may not match what is considered "double concentration" at all institutions. There may be a risk of errors if practitioners refer to a concentration as standard or double strength without communicating the actual concentration.

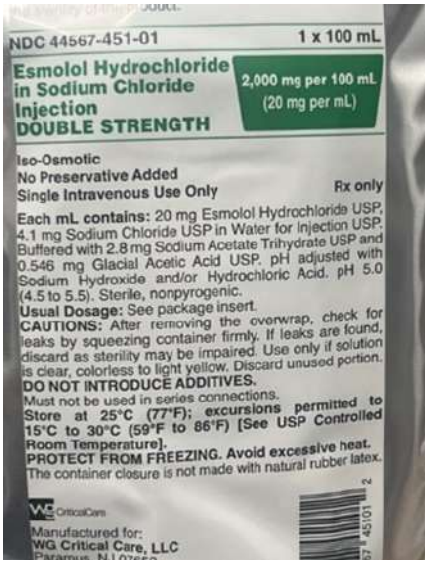

Figure 1. Esmolol label that includes the words "DOUBLE STRENGTH" as a prominent part of the labeling.

We have received similar reports where practitioners have been confused by this terminology. In one case, a nurse programmed an infusion pump as ni**CAR**dipine 100 mg/250 mL (0.4 mg/mL), but the infusion bag contained ni**CAR**dipine 40 mg/200 mL (0.2 mg/mL). This organization's standard ni**CAR**dipine concentration was 0.2 mg/mL and the pharmacy used "double strength" as a concentration descriptor when they compounded 0.4 mg/mL ni**CAR**dipine

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meeting was to create consensus statements to guide practitioners on the safe use of MCB-PN. Prior to the meeting, participants were asked to vote on 18 statements covering various aspects of MCB-PN therapy, including general use, ordering/order review, preparation, labeling, administration, documentation, monitoring, and handling during transitions of care. During the meeting, clinical experts provided dialogue on priority topics, including input on modifications to the statements. A final vote on the modified statements was conducted after the meeting. All 18 statements achieved consensus (80% or greater agreement) and can be found here: ISMP/ASPEN Multi-Chamber Bag Parenteral Nutrition Consensus Statements.

Recommendations

Each consensus statement offers important guidance to reduce potential harm from MCB-PN use. Organizations should review the document, assess gaps, and act to improve safety. During the entire consensus-building process, including planning, data and literature review, and the stakeholder meeting, two recurring themes were identified: 1) the importance of comprehensive clinical decision support to guide practitioners, and 2) concerns regarding the lack of available training programs and education for practitioners in this area, given the complexity and high-alert nature of MCB-PN therapy. Based on these findings, organizations should consider the following recommendations as a starting point.

Optimize clinical decision support. ISMP Guidelines for Sterile Compounding and the Safe Use of Sterile Compounding Technology call for organizations to implement automated compounding devices that are interfaced with the electronic health record (EHR) to eliminate transcription errors. EHR functionality should include clinical decision support (e.g., dose range checking, compatibility, drug-drug interaction checking, duplicate therapy alerts, maximum concentrations for central versus peripheral line administration, maximum osmolarity) to guide practitioners. Evaluate available clinical decision support (in the EHR and automated compounding device) and ensure there are soft warnings and hard stops to alert practitioners when approaching or exceeding limits (e.g., single dose, daily dose, infusion rate, maximum solubility of calcium and phosphate, osmolarity) or omission of an essential component (e.g., ordering a non-electrolyte containing MCB-PN product without the addition of electrolytes). Regularly review alert overrides to determine appropriateness and to improve the safety of MCB-PN practices.

Educate practitioners and assess competency. Given the complexity and high-risk nature of PN, including MCB-PN, specialized practitioners—such as prescribers, pharmacists, pharmacy technicians, nurses, and dietitians, with advanced training—are essential. These practitioners must possess the expertise to write and/or interpret complex nutrition orders, identify potential stability concerns and incompatibilities, and ensure safe preparation and administration. To maintain safety standards, competency assessments for practitioners working with MCB-PN should be rigorous and ongoing. Provide initial and annual training and competency assessments for any practitioners who prescribe, activate, compound, dispense, or administer MCB-PN. Consider including the following in your educational program:

- Educate practitioners about how to calculate the amount of macronutrients, electrolytes, and additives patients will receive from the MCB-PN bag, based on the ordered rate of infusion.
- Educate prescribers how to enter orders for MCB-PN in the EHR using order sets.
- Teach practitioners how to evaluate stability data for additives.
- Establish a formal training process and validate competency for pharmacy technicians and pharmacists who prepare or activate MCB-PN, and for pharmacists who verify the final MCB-PN preparation.
- If compounding services are provided for neonatal and pediatric patients, include age-specific training emphasizing weight-based dosing, and validate the competency of all who may prepare or verify pediatric MCB-PN.

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infusions. The 0.2 mg/mL concentration is commercially available in a premixed bag with the carton label highlighting that it is a "double concentration" as the manufacturer also provides a 0.1 mg/mL product (**Figure 2**). When the nurse read the manufacturer's packaging concentration descriptor of "double concentration" on the 40 mg/200 mL (0.2 mg/mL) product, they selected the double concentration entry in the infusion pump, which was actually the 0.4 mg/mL option, resulting in an underdose.

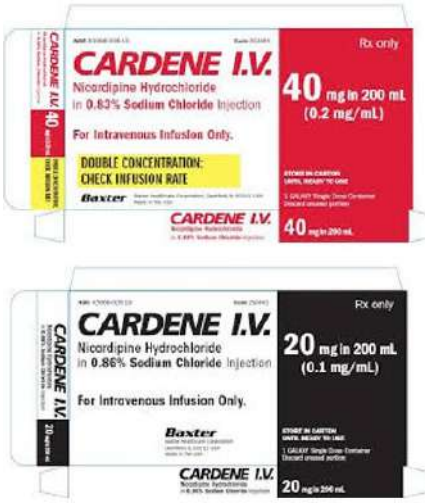

Figure 2. An example of a ni**CAR**dipine (**CARDENE**) 40 mg/200 mL (0.2 mg/mL) product with "double concentration" on the carton (top) to differentiate it from the 20 mg/200 mL (0.1 mg/mL) product (bottom).

We notified the US Food and Drug Administration (FDA) of the risk of medication cartons and infusion labels stating double strength or double concentration. While the FDA does not currently recommend use of the term "double strength," the statement on this generic esmolol label originates from the approval of the original brand product. Organizations should assess the risk of using commercially available premixed infusions with this terminology on the label.

Avoid using terminology such as "standard strength," "double strength," or any other multiple as a descriptor in all systems (e.g., electronic health record, automated dispensing cabinet, infusion pump), on pharmacy-prepared infusion labels, and when communicating concentrations. When possible, provide commercially available, premixed medication infusions in a standard concentration. If compounding is needed, provide standard drug concentrations and

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- Educate nurses about available technology and safe workflows for MCB-PN administration, including safeguards to ensure that the bag has been properly activated prior to administration, and that the prescribed volume is infused over the appropriate timeframe (i.e., not to exceed 24 hours).
- Encourage practitioners to report close calls (i.e., near misses) and errors that reach the patient related to the MCB-PN-use process internally and to ISMP for shared learning.

References

1) Hall JW. Safety, cost, and clinical considerations for the use of premixed parenteral nutrition. *Nutr Clin Pract.* 2015;30(3):325-30.

2) Alfonso JE, Berlana D, Ukleja A, Boullata J. Clinical, ergonomic, and economic outcomes with multichamber bags compared with (hospital) pharmacy compounded bags and multibottle systems: a systematic literature review. *JPEN J Parenter Enteral Nutr.* 2017;41(7):1162-77.

3) Allen P, Bolton A. Premixed PN formulations today: how does this fit into our practice? DNS Support Line. Feb. 2019;41:1, 20-3.

4) Ireton-Jones C, Nishikawa K, Nishikawa R. Home parenteral and enteral nutrition during natural disasters: a guide for clinicians and consumers. *Nutr Clin Pract.* 2019;34(2):216-9.

5) Institute for Safe Medication Practices (ISMP). Survey exposes risks with custom and multi-chamber bag parenteral nutrition – part I. *ISMP Medication Safety Alert! Acute Care.* 2025;30(5):1-5.

what's in a Name?

The "som-/-som-" drug stem name

Medication names containing the "som-/-som-" stem belong to a group of drugs classified as growth hormones. Human growth hormone (HGH), also known as somatotropin, is naturally produced and released from the pituitary gland. HGH helps regulate growth in children, and also helps to maintain normal body structure and metabolism, including serum concentrations of glucose, lipids, and electrolytes in adults. Recombinant human growth hormones (synthetic growth hormones) are US Food and Drug Administration (FDA)-approved medications included in this class of drugs and are indicated for the treatment of growth hormone deficiencies, cachexia, and short bowel syndrome.

Table 1 lists the four growth hormones approved for use in the United States. These medications are administered subcutaneously, daily or weekly. Product-, patient-, and indication-specific nuances exist between the various formulations, so dosing guidelines regarding dose and frequency need to be followed. Injection sites should be rotated to prevent lipohypertrophy (swelling of the subcutaneous tissue that resembles a lipoma). It is important to monitor patients receiving growth hormones for hypersensitivity reactions, fluid retention, reduced insulin sensitivity, pediatric growth response, thyroid and adrenal function, skin changes (for potential malignancy), and intracranial hypertension. Periodic reassessment of the need to continue using these medications is important, especially in those being treated for growth hormone deficiency.

Table 1. List of growth hormones available in the United States.

Generic Name(s)	Brand Name(s)
somatropin	**GENOTROPIN MINIQUICK**; **HUMATROPE**; **NORDITROPIN FLEXPRO**; **NUTROPIN AQ NUSPIN [5, 10, 20]**; **OMNITROPE**; **SEROSTIM**; **ZOMACTON**
somatrogon	**NGENLA**
somapacitan	**SOGROYA**
lonapegsomatropin	**SKYTROFA**

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refer to the American Society of Health-System Pharmacists (ASHP) Standardize 4 Safety initiative. Report close calls and errors that reach patients to your organization's error reporting program and ISMP.

Special Announcement

New video series: Medications via Enteral Feeding Tubes

The American Society of Parenteral and Enteral Nutrition (ASPEN), in collaboration with the University of Rochester Medical Center, presents a five-part video series designed to enhance safety and efficiency when administering medications via enteral feeding tubes. Each short video walks through an essential step—from system-level processes to bedside administration.

- Introduction and Organizational System Considerations
- Prescribing Medications
- Medication Order Review, Preparation, and Dispensing (the pharmacist's role)
- Preparing and Administering Medications (the nursing/caregiver role)
- Special Considerations with Medication Administration (low dose tip syringes, ENFit cleaning, and preparing for home)

The production of these videos was supported by Cardinal Health.

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