Patient safety during critical intravenous solutions shortage: a home infusion providers' collaborative strategy

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Background

Over the past 20 years, management of product shortages has been an essential component of patient care to those requiring intravenous (IV) nutrition support. While multiple factors contribute to medication shortages, weather-related events have been impactful over the past decade. In September 2024, Hurricane Helene caused extensive damage across central North Carolina, including the largest manufacturer of IV solutions in the U.S. This disruption led to nationwide critical shortages of many sterile hydration solutions, concentrated bulk carbohydrate solutions, and sterile water (SW) for injection. The reduced supply affected hospitals, clinics and home infusion (table 1). It also impacted patients reliant on life sustaining IV therapies including parenteral nutrition (PN). The purpose of this abstract is to describe a national home infusion organization's strategy and response plan to ensure patient safety and continued access to care during this crisis.

Methods

Due to the large-scale impact and substantial recovery time, a multidisciplinary and multifaceted action plan was developed, adopted and implemented (figure 1). An ongoing assessment was conducted based on allocation changes from the manufacturer and availability of temporarily authorized imported products.

Nutrition support clinicians reviewed all IV hydration orders for conservation. PN orders were assessed for preservation of SW and Dextrose 70% (D70), adjusting per clinical assessment and product availability (table 2).

Custom compounded PN was adjusted to commercially available multi-chamber bag parenteral nutrition (MCB-PN) where clinically appropriate. MCB-PN was implemented as a base solution for custom compounding, using off-label resources for stability and compatibility. When clinically feasible, MCB-PN was also provided directly to patients with education on bag activation.

Glucose 50% (G50) became available as an alternative carbohydrate source for PN. Implementation of this temporarily authorized imported product required comprehensive pharmacy preparation and multidisciplinary training. This included integration of the product into PN automated compounding devices, collaborative educational sessions with the manufacturer, and clinician education through a mandatory training module, competency assessments and resource materials.

The implementation of G50 required numerous safety measures. The product was added to the organization's PN order form with the capability to calculate grams to calories, percent final concentration and dextrose equivalent for 3:1 stability and Medicare documentation.

Sterile compounding strategies were implemented to avoid wastage. Also, the organization followed ASPEN, NHIA, ISMP and manufacturer guidance while partnering closely with supply chain. Therapy changes required patient education and communication with prescribers.

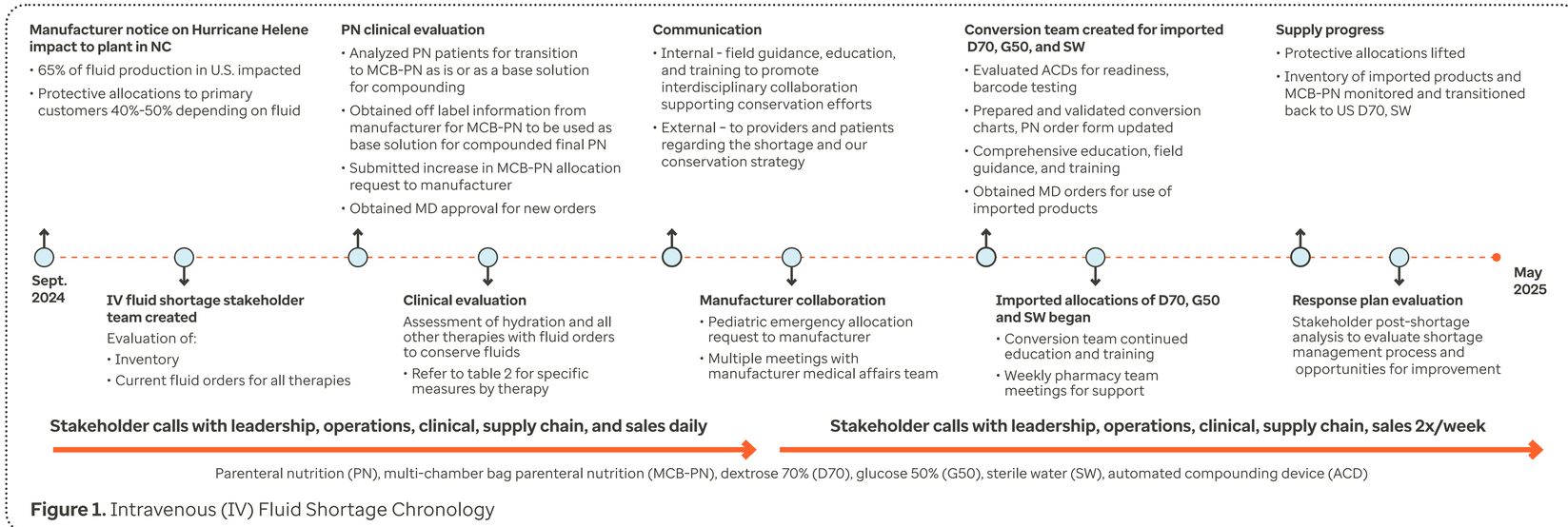

Figure 1. Intravenous (IV) Fluid Shortage Chronology

Results

Orders were successfully adjusted and patients maintained appropriate therapy under collaborative clinical team monitoring. As the shortage resolved and product supply recovered, patients returned to their custom compounded PN and hydration regimens as per ongoing assessment and ASPEN's standard shortages guidance. Safety considerations continued during transition back to pre-shortage products, such as 3:1 stability precautions when adjusting from G50 back to U.S. D70.

Conclusion

Goals of patient safety and access to therapy during this critical shortage were achieved by the adherence to industry guidelines and ongoing collaboration between stakeholders including supply chain, pharmacy, nursing, nutrition, operations and the manufacturer. Communication with patients and prescribers remained constant, keeping all informed as the shortage evolved and eventually resolved.

Table 1. Home Infusion Intravenous (IV) Solutions and Therapies Impacted

IV solutions in critical shortage	Home infusion therapies impacted
• Sterile water	• Hydration
• 0.45% and 0.9% sodium chloride	• Parenteral nutrition
• 5%, 10% and 70% dextrose	• Immunoglobulin
• Lactated Ringers solution	• Biologics

Table 2. Adjustments to Conserve Intravenous (IV) Solutions

Acute sterile compounding	Parenteral nutrition (PN)*	Hydration*	Immunoglobulin*
• Planned compounding to avoid waste • Maximized IV push to use smallest amount of solution possible • Used alternate solutions to conserve 0.9% NaCl • Used SWFI vials for drug reconstitution as possible to conserve SWFI bags for PN compounding • Used proprietary bag/vial systems to avoid use of small volume bags of other sterile IV solutions • For alternate diluents, ensured BUD of CSP or device rate were updated in dispensing system	**Pediatrics and adults with minimal to no enteral absorption:** • Prioritized to continue custom PN • Assessed for alternative to custom PN (MCB-PN) • Implemented temporary authorized imported product – glucose 50% **Adults with some enteral absorption capacity:** • Reduced or weaned PN (PO or EN transition)	• Patients assessed for reducing IV hydration volume or transitioned to oral hydration • Educated patients on oral rehydration solutions • Used commercially available large volume electrolyte solutions to avoid using plain NaCl bags in compounded hydration • Changed small volume Mg2+ containing hydration orders from compounded solutions to premixed small volume bags	**If oral hydration feasible:** • Trial oral hydration protocol per industry standard • If unsuccessful, resume IV hydration with best available solution **If oral hydration unfeasible:** • Continued IV hydration as pre-medication • Obtained order for best available IV hydration solution **Biologics** • Selected best available compatible diluent for product to conserve small volume bags **Anaphylaxis kits** • Followed alternate process to ensure NaCl 500 mL bag not wasted

* Adjustments per clinician assessment and appropriateness.
Sterile water for injection (SWFI), beyond use date (BUD), compounded sterile preparation (CSP), multi-chamber bag PN (MCB-PN)

Disclosures/contact
Authors of this presentation have the following to disclose: Employees; stock holders of UnitedHealth Group
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