Electrolyte Impossible: Clinically Navigating Through the National Electrolyte Shortages

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Introduction

Drug shortages in the U.S. have been at a record high this year as recorded by the FDA. It is the opinion of The Institute of Safe Medication Practices (ISMP) that the ongoing drug shortages are reaching a critical status. Drug shortages are affecting consumers and presenting unprecedented challenges for healthcare providers. In particular, electrolytes and trace minerals for parenteral nutrition (PN) solutions have been limited or not available, a situation that has triggered multiple changes in PN prescriptions. This has added an increase in labor needed for re-writing and checking new orders and compounding the PN. Clinicians must take proactive measures to conserve electrolytes and prioritize to the most clinically appropriate and vulnerable patients while presenting oral nutrient recommendations for those who have some absorptive capacity. Although the FDA recognizes the significant public health impact caused by the recent drug shortages, the burden of addressing patient management during these shortages relies on the interdisciplinary team members’ expertise. Patient safety is the clinicians’ primary concern and therefore more frequent monitoring recommendations may be prudent.

Methods

To evaluate the impact of the PN drug shortages on patient care, labor, and physician orders for clinical monitoring, a national home infusion company developed a survey for clinicians managing PN patients. The survey questions were sent to 46 pharmacists and dietitians within the organization.

Results

The survey results indicated the following:

- 54.3% reported receiving physician change orders for the doses of electrolytes, trace minerals and/or vitamins in an effort to conserve drug.
- 23% of the total PN consumers were able to take oral calcium and 67.5% of those on oral calcium consumed at least 100% or more of the RDI; and
- 56.5% of the patients on an oral calcium supplement were prescribed calcium citrate, while 43.3% of these patients were prescribed calcium carbonate.

The survey also reported these results:

- Lab monitoring was assessed to determine if additional labs were drawn to monitor more closely patients who were taking oral supplements. Responses indicated that ionized calcium and parathyroid hormone levels were ordered in addition to standard calcium levels.
- In view of calcium gluconate being conserved for the pediatric population, ~70% of PN consumers were transitioned to IV calcium chloride as their IV source of calcium, as well as IV magnesium chloride as an alternative to magnesium sulfate.
- When using the alternate electrolyte salts, a proprietary algorithm was used to systematically evaluate compatibility and stability of the ordered PN solution.
- Samples of the PN solution were sent to a lab for analysis in order to ensure appropriate dissolution of the alternate electrolyte salts ordered.

Survey Questions

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<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
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<tr>
<td>Were changes made to the way trace minerals or vitamins were dispensed for home PN patients?</td>
<td>54.3%</td>
<td>45.7%</td>
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<td>What percentage of the overall PN population was able to take oral calcium supplements?</td>
<td>23%</td>
<td></td>
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<td>For patients receiving oral calcium supplements, does the daily dose provide 100% of the RDI for the age group?</td>
<td>&gt;100% of RDI: 24%</td>
<td>100% of RDI: 43.5%</td>
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<td>What form of oral calcium were you supplementing?</td>
<td>Calcium carbonate: 43.5%</td>
<td>Calcium citrate: 56.5%</td>
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<td>What labs were monitored in your oral calcium-supplemented population?</td>
<td>Ca: 52.2%</td>
<td>Ionized Ca: 30.4%</td>
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<tr>
<td>What percentage of your overall PN population was switched to CaCl from Ca gluconate in their PN prescription?</td>
<td>70%</td>
<td></td>
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<td>Have there been any PN stability concerns due to the change to CaCl and MgCl?</td>
<td>Yes: 60.9%</td>
<td>No: 39.1%</td>
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<td>Have any physicians prescribed calcium free-PN at the start of care?</td>
<td>Yes: 63%</td>
<td>No: 37%</td>
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Conclusion

During these drug shortages in the U.S., many factors impact the safe delivery of necessary nutrients for PN-dependent patients. Healthcare providers across the continuum of care should be aware of the increased clinical time that is required in managing these product shortages. As the shortage continues, clinicians must continue to make adjustments in an environment of ever-changing availability of products in the electrolyte, vitamin and mineral supply market to ensure patient safety and optimal clinical outcomes. Evaluation of the management of recent drug shortages affecting PN patients will allow clinicians to develop algorithms of care to promote safe and efficacious delivery to all patients, while finding oral substitutions for patients with limited absorptive capacity.