Standardizing Total Parenteral Nutrition to Reduce Errors

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Introduction
Total parenteral nutrition (TPN) is a vital intravenous nutrition alternative for patients who cannot tolerate enteral feeds. Due to its complex formulation, expertise is required to safely administer TPN. Ordering errors are common, especially in pediatric patients. At Johns Hopkins All Children’s Hospital, TPN order rate was 71% and these orders were associated with a 26% error rate. Pharmacy processing time to correct these errors was 10 minutes per order. Typical ordering error types are shown in Fig. 1. Standardizing TPN reduces errors.

A multidisciplinary group of providers including neonatologists, pharmacists, and dieters, developed standardized TPN solutions (Fig. 2) for neonatal and pediatric patients for both peripheral and central access, based on weight. Inclusion and exclusion criteria were established and integrated into the electronic medical record, along with the new solutions and laboratory monitoring orders. Baseline data was collected from November through December 2014 for TPN order errors and April 2014 through March 2015 for lab draws and blood volume. Multiple PDSA cycles were completed. During Phase I, standardized solutions were introduced and related order errors logged. Phase II evaluated nutritional efficacy of these solutions and mean blood draws were calculated. Phase III analyzed the impact on institutional costs.

Objectives
Our primary goal was to decrease TPN errors and simplify processes. The primary outcome measure was TPN ordering error rates in neonatal and pediatric patients. Secondary outcomes included maximizing resource efficiency, optimizing nutritional efficacy, reducing laboratory draws and evaluating impact on institutional costs.

Aim: To improve patient safety by standardizing TPN solutions and automating the ordering process, to reduce TPN order errors from 26% to 5% by December 2015.

Materials and Methods

Results
TPN order error rate reduced by 94%

Figure 2 - TPN order components specified by provider

Figure 3 - TPN ordering error rates

Figure 5 - Mean monitoring lab draws in first 7 days

Conclusion
Our data shows standardizing TPN solutions and electronic order entry can reduce ordering errors (Fig. 3) and save time, resources and costs, while improving patient safety (Fig. 4). Errors were reduced by 94%, 123 hours were saved in provider ordering and pharmacist clarification time, less blood was drawn (Fig. 5) and lab costs fell when standardized TPN was used. Standardized orders eliminated nearly all error types recorded at baseline.

Figure 1 - Pareto chart of TPN ordering error types at baseline

Figure 4 - Additional savings

Table:

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<th>Month</th>
<th>Total Charges</th>
<th>Lab Draws</th>
<th>Technician Draw Time</th>
<th>Provider/Pharmacist Time</th>
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Total Costs

Total Costs

Technician Draw Time

Provider/Pharmacist Time