



# Improved Efficiency and Reduced Costs with **Premixed Parenteral Nutrition**

**A**t Research Medical Center (RMC), we were tired of spinning our wheels. Every day, pharmacy devoted hours of our precious time to providing customized parenteral nutrition (PN), while it seemed that most of our patients were receiving very similar formulas. We decided to do something about it.

Located in downtown Kansas City, Missouri, RMC is a 350-bed tertiary care hospital. Our average daily census is 250 patients, of which approximately 15 receive PN therapy. While many different practitioners order PN, a good deal of them use our standard central and peripheral formulas and have become very adept at making infusion rate changes, instead of concentration changes, to meet nutrition requirements.

## Outsourced PN Compounding

In 2005, we began to outsource the compounding of our PN to a local pharmacy. This brought great satisfaction to our department, and had minimal effects on the rest of the hospital. We went from dedicating one FTE to PN to just two to three hours of a pharmacist's time per day. With a lowered compounding volume, we were able to use a compounding aseptic isolator (CAI) to prepare IV products, instead of building a cleanroom to comply with USP <797> regulations. However, you simply cannot fit much admixing equipment in an isolator. We realized that we were at the mercy of our compounding pharmacy, and while we were experiencing excellent service, we were not comfortable with that dependency.

Outsourcing only costs about \$50 per patient day of therapy, but offers little control over unforeseen or emergent events. And although PN components are not very expensive, when we compound them in the pharmacy, we invest a disproportionate amount of time and effort in the verification and order-entry process, in comparison to other items we dispense. The real expense is our time, but at an annual cost of \$250,000, we certainly welcomed any savings we could achieve in the acquisition of adult PN products.

## PN Delivery Times

RMC's medication delivery policy requires us to deliver routine medications within two hours of ordering. However, it took us seven to 30 hours to deliver custom PN, due to order deadlines and a standard hang time of 9:00PM. Previously, we had justified this initiation time, because compounding PN is a very complicated process and because people often go days without eating. We felt we were not "causing any harm." But with ever-shorter hospital lengths of stay and the fact that nearly half of all inpatients are malnourished<sup>1</sup>, we realized we needed to take full advantage of this therapy, when it is appropriate, to help our patients and increase the satisfaction of our customers. The benefit of early enteral nutrition in critical care patients has been well documented<sup>2</sup>. Therefore, we decided it should never take a full day to deliver medication in the hospital, no matter how you justify it, and we should

be doing more for our patients than "not causing harm."

## Premixed PN as a Solution

Manufactured, premixed PN was an obvious solution to our problem of dependency, time to initiation, staff time demands, and cost. Also, it is often safer to use an FDA-approved product.

Premix PN is not a new concept, though until recently, we were unable to purchase the premixed PN products we wanted. I decided to investigate our available options.

We found that Baxter's Clinimix E 5/15 was nearly the same as our standard central PN formula, differing slightly in its electrolytes. I determined that we could change our standard PN solutions to a premixed product very easily, and it would be safer, faster, and cheaper. There were also a variety of options for using these products – exclusively as premixed products, as starter bags, or as bulk solutions to simplify compounding. The question became "How can we best use premixed PN to deliver nutrition?" rather than "Should we use it?"

That said, RMC has continued offering customized PN for our NICU patients. While most adults can be appropriately treated with premixed PN, we do not limit physicians strictly to premixed products. We felt the premixed concentrations would be much better accepted if we did not restrict their practices, and we felt simply introducing the product would lead to acceptance and use. We decided on a best-of-both-worlds approach: using premixed PN as a standard and compounding PN whenever changes are made.

## Process Changes

There were three main issues we had to address: First, we had previously used a three-in-one solution containing lipids, but no such Clinimix product was available in the United States. We could add lipids to the bags, which are oversized and feature an admixture port, but that would have changed the concentration of the contents and added more work for pharmacy. Instead, we chose to infuse the lipids separately, at night over the course of 10 hours; our custom PN remained a three-in-one solution. We have experienced no complications with this system.

Secondly, because premixed PN is available in fixed volumes (1 or 2 L), we customize the infusion time (<24-hour supply) or overfill (>24-hour supply) of each bag, instead of providing a customized 24-hour supply of PN based on a prescribed infusion rate. A 2-L bag is usually enough to last a patient 24 hours, but if not, our information system and electronic medication administration record (EMAR) allows us to easily schedule a new bag to be dispensed when it is needed.



Photos courtesy of Baxter Healthcare Corporation

# The REES SCIENTIFIC CentronEMS

Multiple Departments. One answer.



**You** all have critical equipment (refrigerators, freezers, incubators and more) that need to be monitored and maintained. Each department's staff spends a considerable portion of their day recording temperature, humidity, pressure and flow readings. Automating environmental monitoring increases accuracy, provides early warnings to address problems before they occur, maintains Joint Commission and other regulatory compliance, and allows staff to focus on other critical tasks.

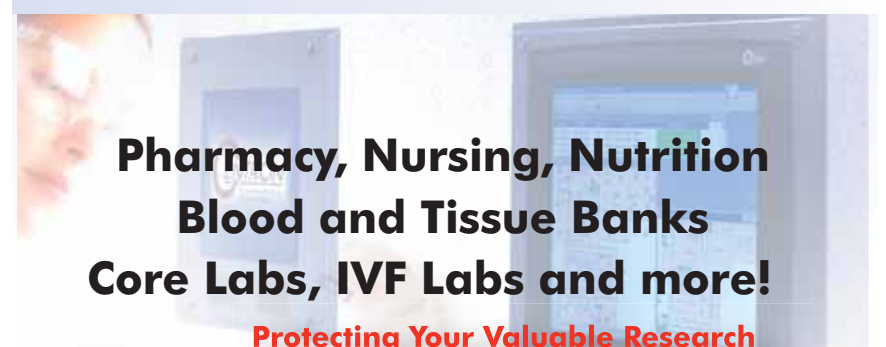
**Monitor your equipment regardless of its location.** A single Centron system can monitor numerous departments within your facility whether they are on a different floor, in a different building, or even in a different town.

**Share costs but not control.** Each input can be assigned to a specific department and viewed only by the authorized users. Allow each department to handle its own alarms, generate its own reports and use its own SOPs.

**Module-based design provides flexibility and expandability.** Wireless sensors make retrofitting existing facilities easy and economical and can be used in conjunction with wired sensors.

**Address problems before they occur.** With the latest release of our Centron EMS software, you will find new features including a pre-alarm alert system with sonic, relay and email notification providing early warnings that allow you to resolve a potential problem before anything is compromised.

For more information, circle #57 on the Reader Service Card



**Pharmacy, Nursing, Nutrition  
Blood and Tissue Banks  
Core Labs, IVF Labs and more!**

Protecting Your Valuable Research

**REES SCIENTIFIC**  
An ISO 9001:2000 Company

1007 Whitehead Road Ext. Trenton, NJ 08638  
609.530.1055 phone 609.530.1854 fax  
sales@reesscientific.com www.reesscientific.com

## Multivitamin and Trace Element Calculation Chart

Figure 1.

PN Rate (mL/hr)	Daily Volume Required (mL)	1- or 2-L Bags	Daily Scheduling	Multivitamin Needed/Bag (10 mL/day)	Trace Elements Needed/Bag (10 mL/day)	Famotidine Needed/Bag (40 mL/day)
30	720	1	Q24H	13.9	1.4	55.6
35	840	1	Q24H	11.9	1.2	47.6
40	960	1	Q24H	10.4	1.0	41.7
45	1080	2	Q24H	18.5	1.9	74.1
50	1200	2	Q24H	16.7	1.7	66.7
55	1320	2	Q24H	15.2	1.5	60.6
60	1440	2	Q24H	13.9	1.4	55.6
65	1560	2	Q24H	13.1	1.3	51.3
70	1680	2	Q24H	11.9	1.2	47.6
75	1800	2	Q24H	11.1	1.1	44.4
80	1920	2	Q24H	10.4	1.0	41.7
85	2040	2	Q23H	9.8	0.98	39.2
90	2160	2	Q22H	9.3	0.93	37.0
95	2280	2	Q21H	8.8	0.88	35.1
100	2400	2	Q20H	8.3	0.83	33.3
105	2520	2	Q19H	7.9	0.79	31.8
110	2640	2	Q18H	7.6	0.76	30.3

This custom infusion time leads us to the third issue. With different amounts of waste in each bag, we needed to determine the amount of multivitamin and trace elements to add to each bag in order to deliver the correct dose. We developed a chart (See Figure 1) that allows us to enter new orders without any calculations, saving our pharmacists time in verification, paperwork, and filing. This chart is kept near each pharmacist workstation for quick reference. One label, listing all of the PN's contents, prints from the information system. With no calculations or standard hang times, we process and fill premixed orders just like we do maintenance fluid orders. While it would be easy to customize the electrolyte contents of the premixed products when changes are ordered, we would have to implement a process to monitor compatibility<sup>3</sup>. We could fill over 95% of our adult PN orders with premixed PN in this way, but we like our "no paperwork or calculations" method. Our use varies, but premixed PN accounts for 50 to 75% of our PNs, even though we convert to a compound when any electrolyte or concentration change is made.

### Conclusion

Premixed PN allows us to deliver nutrition to

our patients in a safer, faster, and cheaper way. Our dual-delivery method still allows us to customize PN for our patients, does not affect the way practitioners write orders, and decreases our preparation time by more than 50%. We start patients on PN within two hours and save approximately 20% on total adult PN acquisition costs (33% less per premixed PN patient). We encountered no adversity in implementing this project and have experienced no major problems. While there are opportunities to utilize premixed PN more extensively in the future, we are pleased with our success in doing so thus far. ■



*Frank E. Wonka IV, PharmD, has worked for Research Medical Center for the last five years. He received a doctorate of pharmacy from the University Of Kansas School of Pharmacy.*

### References:

1. Kruiuzenga HM, Van Tulder MW, Seidel JC, et al. Effectiveness and cost-effectiveness of early screening and treatment of malnourished patients. *Am J Clin Nutr.* 2005 Nov;82(5):1082-9.
2. Farber MS, Moses J, Korn M. Reducing costs and patient morbidity in the enterally fed intensive care unit patient. *J Parenter Enteral Nutr.* 2005;29:S62-9.
3. Newton DW, Driscoll DF. Calcium and phosphate compatibility: revisited again. *Am J Health-Syst Pharm.* 2008;65:73-80.

### WHERE TO FIND IT:

**Baxter Healthcare Corporation** ..... Circle reader service number 20  
or visit [www.baxter.com](http://www.baxter.com)