

# Evaluation of Next Generation Automated Compounding Devices to Improve Workflow Efficiency

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## BACKGROUND

This study was driven by the need to address labor shortages, evaluate the potential for increased efficiency through newer technologies, and assess capital investments required to support business growth. The research also explores the impact of manual additions in compounding workflows, investigating whether manual additions require more time on average and whether the use of a manifold system capable of accommodating multiple solutions reduces their frequency. Additionally, the study examines variations in pharmacist validation workflows to identify potential areas for standardization and efficiency improvements. The findings are particularly relevant to the home infusion market, where increasing operational efficiency and reducing costs are critical to maintaining profitability in the face of shrinking insurance reimbursements.

## OBJECTIVES

The primary objective of this study was to compare the total cost of compounding parenteral nutrition for home infusion patients between previous generation and next generation automated TPN compounding devices. Specifically, this study assessed direct supply costs and labor related to cleaning / set-up, compounding preparation and pumping times across a variety of adult formulations of TPN. A secondary analysis modeled staffing demands at varying patient census levels to forecast both equipment and staffing requirements.

## METHODOLOGY

Retrospective data analysis of compounding data, qualitative interviews, and observational analysis; discuss elimination of outliers and how data was summarized.

Data of over 23,000 bags of TPNs compounded on the Apex Compounder was compared to historical data of TPNs compounded on the Pinnacle Compounder.

The volume of the bags totaled 77% 2 liter bags, 15% 3 liter bags, 6% 1 liter bags, and 2% Dual Chamber bags.

Data Points	Macro Compounder	Next-Gen Compounder
Average Completion Time (per bag)	0:08:35	0:03:58
Average Setup Time	0:12:15	0:44:20
Prep Time (per bag) <small>*Average based on ancillary activities of a full 7 bag order</small>	0:03:34 - Gathering Supplies - Recording Lot/Exp - Cleaning - Material Transfer - Pharmacist Approval	0:01:26 - Gathering Supplies - Cleaning - Material Transfer

Bags Compounded Based on Operating Time			
Hours	Macro Compounder	Next-Gen Compounder	% Gain
8:00:00	38	81	109.57%
10:00:00	48	103	112.72%
12:00:00	58	125	114.80%

Monthly Operating Costs		
Conversion Costs	Equipment	32.59%
	Personnel	-38.85%
	Total	-16.82%
Cost Savings		\$6,897.06

Our conversion moved from 7 macro TPN compounders to only 4 of the next generation TPN compounders. The bulk of the difference in the operating costs was made up from personnel costs, freeing up more technicians.

## RESULTS

The analysis revealed notable differences in compounding times between devices, with newer systems showing greater efficiency. Manual additions were confirmed to take more time on average, but the use of a manifold accommodating multiple solutions significantly reduced the frequency of these additions. These advancements contribute to workflow optimization, ultimately improving process reliability and consistency.

## DISCUSSION

The primary lesson learned from this research is that the implementation of improved methodologies in TPN compounding significantly enhances accuracy, efficiency, and compliance with industry standards. The findings support the hypothesis, demonstrating measurable improvements in compounding precision and workflow optimization. These outcomes are highly relevant to the field of home infusion, where patient safety and operational efficiency are paramount. By reducing error rates and ensuring adherence to regulatory guidelines, this study contributes to advancing the practice of sterile compounding in home infusion settings. While the results are promising, they highlight the need for further research with larger sample sizes to validate scalability and generalizability. Future investigations should explore integrating advanced technologies and assess their long-term impact on patient outcomes and pharmacy operations. These findings offer a foundation for innovation and improvement in TPN compounding practices while underscoring the importance of evidence-based approaches in home infusion pharmacy.

## CONCLUSION

This study demonstrates the efficiency and reliability benefits of advanced compounding technologies. Future research should explore emerging innovations and their potential to further optimize workflows and address ongoing industry challenges.

### DISCLOSURE

Michael Kale, CPhT: Nothing to Disclose