

# ECONOMIC ASSESSMENT IN THE PREPARATION OF PARENTERAL NUTRITION: MANUAL COMPOUNDED BAGS VERSUS THREE-CHAMBER BAGS. NUTRIPAR STUDY

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## Background

Parenteral nutrition (PN) is a treatment support approach used widely to provide nutrition to patients who have an inaccessible or non-functioning intestine<sup>1</sup>.

Currently all-in-one formulations (two or three-chamber) are prepared manually as compounded bags (CB) by hospital pharmacies.

The use of commercial three-chamber bags (TCB) could lead to cost savings with respect to CB prepared at the hospital pharmacy<sup>2,3</sup>. Moreover, errors related to PN may be minimized with the use of standard commercial preparations.

## Objectives

To analyze and compare time and costs with the use of PN in TCB (Olimel N9) versus CB in hospital pharmacy services, and to compare the number of errors within the preparation process of each kind of bag.

## Methods

Economic, cost accounting, observational, prospective and non-interventional study.

The NUTRIPAR study was conducted in 10 hospital pharmacy Spanish services, within 3 months in 2014.

Costs (€, 2014) assessed were manpower (prescription, preparation, validation and microbiological controls) and materials (bags, nutrition solutions and medical supplies).

To compare cost and times, only PN bags with equivalent nutritional and volume value were included. Pearson's Chi-squared test for categorical variables, and Student's t tests for quantitative variables were performed to compare the results.

Table 2: Total Time of PN production, min

Specific steps of the manufacturing process	CB (n = 97)	TCB (n = 295)
	Mean (SD) min	Mean (SD) min
Validation and transcription	1.99 (1.69)	2.47 (3.60)
PN prescription register	1.10 (0.89)	0.83 (0.81)
Labelling*	2.67 (1.50)	1.01 (0.73)
Preparation of materials*	6.09 (1.97)	1.03 (1.75)
PN preparation*	13.87 (4.82)	2.70 (2.33)
Packaging*	1.35 (0.61)	0.82 (0.66)
PN elaboration register	1.08 (0.73)	0.78 (0.87)
Control of finished product*	1.25 (0.85)	0.56 (0.55)
<b>Common steps in the manufacturing process</b>		
Laminar flow cabinet cleaning*	10.27 (5.76)	6.42 (5.54)
Microbiological control of finished product*	8.59 (5.35)	1.90 (5.00)
Microbiological control of laminar flow cabinet	0.28 (0.24)	0.07 (0.19)
Control of laminar flow cabinet filter integrity	0.12 (0.10)	0.06 (0.08)
Microbiological control of PN elaboration rooms	0.15 (0.11)	0.03 (0.14)
<b>Total manpower time*</b>	<b>57.61 (15.58)</b>	<b>18.67 (9.52)</b>

\*p<0.01  
CB: manual compounded bag; PN: parenteral nutrition; SD: standar desviation; TCB: three-chamber bags

## Results

The total sample of 597 bags was assessed: 295 TCB and 302 CB.

In order to perform the analysis for the comparison of costs and time spent, a sub-sample was used (n=392: 295 TCB and 97 CB), with similar volume and composition: 1,500 mL bags: 219 TCB and 82 CB; 2,000 mL bags: 76 TCB and 15 CB.

The average total cost per TCB bag was 53.30±11.27€ (manpower: 4.89€; material + solutions: 48.40€) and per CB 58.22±7.33€ (manpower: 14.69€; material + solutions: 43.53€). Total cost savings calculated with use of TCB vs CB was 4.92€ (p<0.01) (Table 1). Other not considered costs (such as adverse events due to compounding errors) would increase these savings.

Table 1: Total Costs of PN production, €

Specific steps in manufacturing process	CB (n = 97)	TCB (n = 295)
	Mean (SD) €	Mean (SD) €
Validation and transcription	0.70 (0.76)	0.97 (1.62)
PN prescription register	0.27 (0.25)	0.28 (0.33)
Labelling*	0.57 (0.32)	0.25 (0.19)
Preparation of materials*	1.47 (0.52)	0.49 (0.45)
PN preparation*	3.48 (1.40)	0.68 (0.60)
Packaging*	0.32 (0.17)	0.19 (0.17)
PN elaboration register	0.24 (0.20)	0.19 (0.23)
Control of finished product*	0.29 (0.17)	0.16 (0.14)
<b>Common steps in manufacturing process</b>		
Laminar flow cabinet cleaning*	2.42 (1.41)	1.58 (1.28)
Microbiological control of finished product*	2.64 (2.00)	0.07 (0.75)
Microbiological control of laminar flow cabinet	0.06 (0.05)	0.02 (0.03)
Control of laminar flow cabinet filter integrity	0.03 (0.02)	0.01 (0.01)
Microbiological control of PN elaboration rooms	0.03 (0.02)	0.01 (0.03)
<b>Total manpower cost*</b>	<b>14.69 (5.08)</b>	<b>4.89 (2.89)</b>
<b>Materials and components</b>		
PN composition*	29.12 (3.85)	38.89 (3.89)
Materials*	6.53 (2.10)	0.56 (0.77)
Common materials	7.88 (1.84)	8.96 (7.55)
<b>Total material and component cost*</b>	<b>43.53 (4.16)</b>	<b>48.40 (9.17)</b>
<b>TOTAL*</b>	<b>58.22 (7.33)</b>	<b>53.30 (11.27)</b>

\*p<0.01  
CB: manual compounded bag; PN: parenteral nutrition; SD: standar desviation; TCB: three-chamber bags

The average manpower time required for TCB was 18.67±9.52 min and for CB 57.61±15.58 min, resulting on average in a 38.94 min time savings for products of comparable nutritional value (p<0.01) (Table 2).

## Conclusions

The use of TCB provided savings in cost and time, as well as fewer errors compared to CB preparation.

Since cost-reduction of treatments is needed, the use of TCB for standard adult PN could lead to cost savings.

The total number of errors was 3 (1%) and 15 (5%) for TCB and CB, respectively (p<0.01) (Table 3).

In CB, labelling was the process during which a higher number of errors was detected (2% of cases) followed by validation and transcription (1.3% of cases).

Table 3: Total Errors detected in PN preparation, n (%)

Prescription	CB (n = 302)	TCB (n = 295)
	n (%)	n (%)
Incomplete prescription	2 (0.7%)	0 (0.0%)
<b>Validation</b>		
Duplicated PN	4 (1.3%)	1 (0.3%)
Lack of pharmacist signature	2 (0.7%)	0 (0.0%)
Transcription to another patient, corrected in time	0 (0.0%)	1 (0.3%)
Incorrect day transcription	1 (0.3%)	0 (0.0%)
<b>Labelling</b>		
Label printing error	6 (2.0%)	1 (0.3%)
Label printing error and patient label change	5 (1.7%)	1 (0.3%)
<b>PN preparation</b>		
Use of smaller bag	3 (1.0%)	1 (0.3%)
Incorrect dosage and volume	1 (0.3%)	0 (0.0%)
Breaking of PN bag	1 (0.3%)	0 (0.0%)
Some component is missed	0 (0.0%)	1 (0.3%)
<b>Total*</b>	<b>15 (5%)</b>	<b>3 (1%)</b>

\*p<0.01  
CB: manual compounded bag; PN: parenteral nutrition; SD: standar desviation; TCB: three-chamber bags

## References

<sup>1</sup> Berlana D, Barraquer A, Sabin P, Cicharro L, Pérez A, Puiggrós C, Burgos R, Martínez-Cutillas J. Impact of parenteral nutrition standardization on costs and quality in adult patients. Nutr Hosp. 2014;30:351-358

<sup>2</sup> Pichard C, Schwarz G, Frei A, Kyle U, Jolliet P, Moreau P, et al. Economic investigation of the use of three-compartment total parenteral nutrition bag: prospective randomized unblinded controlled study. Clin Nutr 2000;19:245-251

<sup>3</sup> Berlana D, Sabin P, Gimeno-Ballester V, Romero-Jiménez R, Zapata-Rojas A, Márquez E, Matínez-Cutillas J, et al. Cost analysis of adult parenteral nutrition systems: three-compartment bag versus customized. Nutr Hosp 2013;28:2135-2141

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