Cost-effectiveness Comparison of High Protein Enteral Feedings Used in the ICU: Retrospective Adjusted Analysis

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BACKGROUND

- Critical care nutrition guidelines advise providing an increased amount of protein[1]
- Critical care nutrition guidelines also suggest enteral nutrition (EN) formulas containing immunonutrients for surgical and trauma patients[1]
- High protein peptide-based EN formulas with immunonutrients (PBIM) are priced significantly higher than high protein standard formulas (StdHP)
- To our knowledge, this is the first cost comparison including different PBIM formulations and StdHP in ICU patients

OBJECTIVES

- The primary aim was to compare hospital costs associated with use of different PBIM formulas and between StdHP formula in patients with an ICU stay

METHODS

- The Premier Healthcare Database was utilized to extract data from 27 US hospitals between October 2015 – February 2019
- Retrospective review of three groups according to EN formula received with 25% of calories from protein: IMPACT® Peptide 1.5 (IP), Pivot® 1.5 Cal (PC) and StdHP formulas, i.e., Replete® and Promote®

- **Inclusion criteria:**
  - Adult patients (age ≥ 18 years)
  - Charge for ICU stay
  - Exclusive use of IP, PC, or StdHP for at least 3 days
- A descriptive analysis characterized patients meeting selection criteria and pairwise-comparisons were made between IP vs. PC, and IP vs. StdHP
- Generalized linear model (GLM) regression with log link followed to determine the effect of different formulas on the outcome of total cost/day
- Cost per day was selected as the health economic measure to take differences in length of stay (LOS) into account
- 3M™ All Patient Refined™ Diagnosis Related Group (APR-DRG) Risk of Mortality and Severity of Illness scales had 4 categories: minor, moderate, severe, extreme
- Healthcare coverage type included Medicare, Medicaid, managed care, commercial, and other

References: 1) Taylor BE et al. CCM 2016; 44(2): 390-438.

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RESULTS

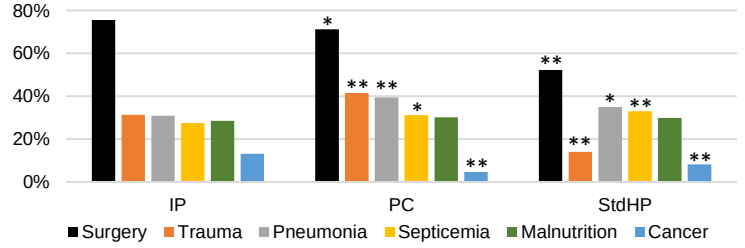
- 5,752 patients were included across IP (n=2,525), PC (n=759), and StdHP (n=2,468) groups. Demographics and other characteristics are described in **Table 1**
- Majority of patients required mechanical ventilation (78%) and surgery (65%). Clinical diagnoses and comorbidities are available in **Table 1 & Fig. 1**
- Median volume of formula billed per patient stay was 7L. over a median of 7 days
- Median total cost of EN formula was $109 for IP, $248 for PC, and $43 for StdHP (IP vs. PC; and IP vs. StdHP; p <0.001)
- Unadjusted cost per day ($4,028 +/- 1,867) and length of stay (LOS) were lowest for the StdHP group **(Fig. 2)**

Table 1. Demographic, Visit, and Hospital Characteristics (n=5,752)

Measure	IP	PC	StdHP
Age, median (years)	59	58	65**
Male (%)	66	73*	50**
Race, Black (%)	6	12**	10**
Other (%)	6	8	9
Hispanic or Latino ethnicity (%)	3	2**	10**
Teaching hospital (%)	95	84**	89**
Mechanical ventilation (%)	76	85**	78
APR-DRG severity of illness, Extreme (%)	71	78**	77**
Elective admission (%)	14	4**	6**
Inpatient mortality (%)	19	20	17*
Discharge to home / home health (%)	25	15**	20*
30-d readmission (%)	9	12*	21**
Health Care Coverage, Medicare (%)	39	36**	61**

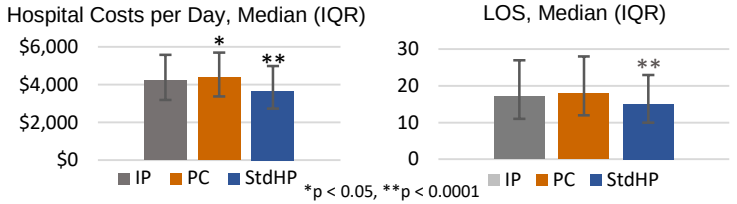
*p < 0.05, **p < 0.0001 compared to IP. For categorical variables, p-values represent difference in distribution

Figure 1. Clinical Diagnoses and Comorbidities by EN Formula Group



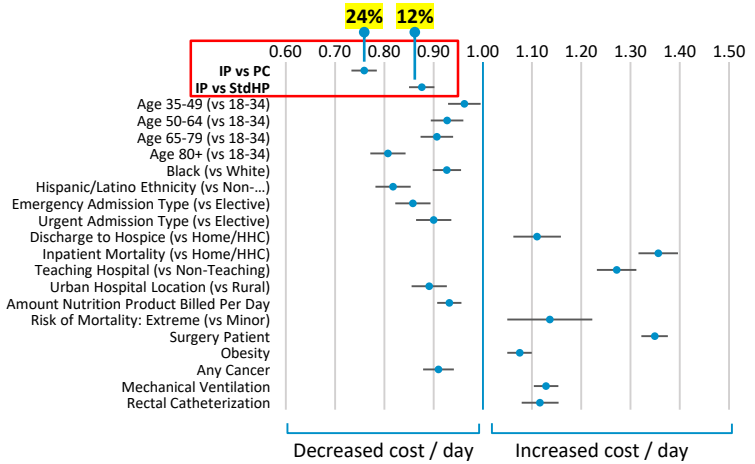
*p < 0.05, **p < 0.0001

Figure 2. Unadjusted Cost/Day and LOS by EN Formula Group



*p < 0.05, **p < 0.0001

Figure 3. GLM Regression with Log Link, Associations with Cost per Day



IP vs. PC (EC: 0.76, CI: 0.73-0.79, p<0.0001). **IP vs. StdHP** (EC: 0.88, CI: 0.86-0.90, p<0.0001)
EC=exponentiated coefficient, CI= confidence interval. Model included all categorical options for each variable. Malnutrition, septicemia, pneumonia, diabetes, trauma diagnosis, APR-DRG severity of illness, days billed of antibiotic and antidiarrheal medications, hospital region and urban location, sex, and admission place of origin also included in model.

CONCLUSION

- In this retrospective database review, PBIM groups tended to be of younger age, less reliant on Medicare coverage, and to have higher rates of surgery and trauma than the StdHP group
- After controlling for potential clinical and healthcare confounders, total hospital cost per day was 24% less for IP than PC, and 12% less for IP than StdHP; p<0.001) **(Fig. 3)**
- Additional studies are required to corroborate these findings; however, these results show the importance of considering overall healthcare utilization when comparing differences in EN formulation and product cost