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**BACKGROUND**

- Critical care nutrition guidelines advise providing an increased amount of protein
- Critical care nutrition guidelines also suggest enteral nutrition (EN) formulas containing immunonutrients for surgical and trauma patients
- 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
  - Exclusion 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 an 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

**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)

**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

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

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

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

*p < 0.05, **p < 0.001 compared to IP. For categorical variables, p-values represent difference in distribution

**Figure 1. Clinical Diagnoses and Comorbidities by EN Formula Group**

- Surgery
- Trauma
- Pneumonia
- Septicemia
- Malnutrition
- Cancer

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

**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 anti-inflammatory medications, hospital region and urban location, sex, and admission place of origin also included in model.

- 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
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- 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