NST ! THE WHITE ARMY IS HERE! NUTRITIONAL CHALLENGES OF GERIATRIC PATIENTS

Specific supplements for the older adults

P. Bravo (ES)
SPECIFIC SUPPLEMENTS FOR THE OLDER ADULTS

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RPMD Burriana (SPAIN)
Nutritional Treatment of Hyperlipidemia in Children

Lecture Objectives

• Introduction to the subject
• Screening for hyperlipidemia in childhood
• Diagnosis and evaluation of hyperlipidemia in children
• CHILD1 and CHILD2 nutritional intervention
• Familial hypercholesterolemia (FH)
INTRODUCTION

- Malnutrition prevalence in older adults:
  - Hospitalized older adults: up to 50%
  - Institutionalized older adults: 18-38.6%

  - Meta-analysis (55 studies, 9187 older patients) indicated the oral nutritional intervention in hospitalized older patients ↓ 34% mortality and ↓ 28% morbidity.

  - Review (62 trials, 10187 older patients) indicated the oral nutritional intervention produced weight changes. ↓ Mortality significant in undernourished patients.

- ESPEN guidelines: not age-specific formula or specific supplement for particular conditions as frailty, pressure ulcers (PU)...

  - Protein and energy supplementation in elderly people at risk from malnutrition
    Milne AC, Potter J, Vivanti A, Avenell A.
    Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD003288
TOPICS

Specific supplements

Sarcopenia
Frailty

Pressure ulcers

Low volumes and different textures
SPECIFIC SUPPLEMENTS FOR OLDER PATIENTS WITH SARCOPENIA OR FRAILTY
Sarcopenia is an age-related condition characterized by a loss of skeletal muscle mass with accompanying loss of strength, power, and the ability to resist fatigue.

Correlated with

- **Prevalence**
  - 15-30% of adults > 60 years
  - 50% of people > 80 years
  - Institutionalized patients
    - 35% of older patients (20% in men; 45% in women)\(\text{PP046-MON}\)
SPECIFIC SUPPLEMENTS FOR PATIENTS WITH SARCOPENIA

• Nutritional options

BCAA Leucine
β-HMB

Vitamin D ±
Calcium supplements

Omega-3 fatty acids (DHA, EPA)

• β-HMB + Vit D/Ca² enriched hyperproteic-hypercaloric suppl.
• β-HMB + Vit D/Ca² enriched hyperproteic suppl.
• Omega-3 FA + Vit D/Ca² enriched Hyperproteic-hypercaloric suppl.
• Leucine/ hyperproteic enriched suppl. ± Vit D/Ca²
What is the evidence available so far?
### ESSENTIAL AMINO ACIDS WITHOUT EXERCISE

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Design</th>
<th>Sample size (n)</th>
<th>Type of patients</th>
<th>Population age (y) Mean ± SD Sex (m/w)</th>
<th>Duration (wk)</th>
<th>Measurement of body composition</th>
<th>Strength measurement</th>
<th>Quantity and type of intervention</th>
<th>Main Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dal Negro et al. (2010)</td>
<td>RCT</td>
<td>n=32</td>
<td>Elderly with COPD and sarcopenia</td>
<td>75 ±7 (25/7)</td>
<td>12 weeks</td>
<td>BIA</td>
<td>NO</td>
<td>IG: EEA 4g/twice a day CG: placebo</td>
<td>↑ Fat free mass in intervention group. ↑ Physical activity; ↑ Body weight</td>
</tr>
<tr>
<td>Børsheim et al. (2008)</td>
<td>Cohort study</td>
<td>n=12</td>
<td>Glucose intolerant elderly</td>
<td>67±7 (5/7)</td>
<td>16 weeks</td>
<td>DEXA</td>
<td>YES</td>
<td>EAA (Leucine): 22g/day</td>
<td>↑ LBM (significant) ↑ Walking speed. ↑ strength</td>
</tr>
<tr>
<td>Dillon et al. (2009)</td>
<td>RCT</td>
<td>n=14</td>
<td>Healthy elderly</td>
<td>68±2 (0/14)</td>
<td>12 weeks</td>
<td>DEXA</td>
<td>YES</td>
<td>IG: EAA (Leucine): 15g/day (20 cap twice a day. CG: placebo</td>
<td>↑ LBM (significantly) No changes in muscle strength</td>
</tr>
<tr>
<td>Ferrando et al. (2010)</td>
<td>RCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EAA (leucine): 15 g/day** CG: non-caloric diet soda (studied first)</td>
<td>No effects of EEA in maintenance of LBM. Fat mass maintained equally. No changes in strength</td>
</tr>
<tr>
<td>Rondanelli et al. (2011)</td>
<td>RT</td>
<td></td>
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<td></td>
<td>EAA (leucine): 4 g twice a day** CG: placebo</td>
<td>↑ depression level. ↑ Nutritional status (both groups) ↑ Muscle function (both groups) ↑ EAA, ↓ QL (both groups)</td>
</tr>
</tbody>
</table>

- Lower sample sizes.
- Main component: Leucine.
- Variable dosage regimens.
- Only 1 study in sarcopenia patients.
- **Variable results** in body composition and strength.

Adapted, modified and extended to Malafarina (JAMDA 2013)

**between meals
LEUCINE SUPPLEMENTATION WITHOUT EXERCISE

<table>
<thead>
<tr>
<th>Authors</th>
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<th>Type of patients</th>
<th>Population age (y) Mean ± SD Sex (m/w)</th>
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<th>Measurement of body composition</th>
<th>Strength measurement</th>
<th>Quantity and type of intervention</th>
<th>Main Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verhoeven et al (2009)</td>
<td>RCT</td>
<td>n= 30</td>
<td>Healthy elderly men</td>
<td>71.1 ± 4 (30/0)</td>
<td>12 weeks</td>
<td>DXA</td>
<td>YES</td>
<td>IG: Leucine: 7.5 g/d** CG: placebo</td>
<td>Body Composition: no change Strength: No changes- No differences between groups Glycemic control: not change</td>
</tr>
<tr>
<td>Leenders et al (2011)</td>
<td>RCT</td>
<td>n=57</td>
<td>Elderly Type 2 diabetes men</td>
<td>71.1 ± 1 (57/0)</td>
<td>24 weeks</td>
<td>DXA</td>
<td>YES</td>
<td>IG: Leucine: 7.5 g/d** CG: placebo</td>
<td>FFM and FM not change; Strength: ↑ No differences between groups Glycemic control: not change</td>
</tr>
</tbody>
</table>

- No many studies only with leucine.
- Both are realized in healthy elderly.
- No comparison with other AA.
- ↑ nº capsules to achieve the dosage.
- **No changes** in body composition or strength/No differences between groups.

Adapted and modified to Malafarina (JAMDA 2013) **between meals
### HMB SUPPLEMENTATION WITHOUT EXERCISE

<table>
<thead>
<tr>
<th>Authors (year)</th>
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<th>Strength measurement</th>
<th>Quantity and type of intervention</th>
<th>Main Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flakoll et al (2004)</td>
<td>RCT</td>
<td>n=50</td>
<td>Elderly women</td>
<td>76.7 (0/50)</td>
<td>12 weeks</td>
<td>BIA</td>
<td>YES</td>
<td>IG: HMB 2g + arginine + lysine CG: placebo</td>
<td>↑ FFM in IG (not significant)</td>
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<td>↑ handgrip strength in IG (significant)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>↑ functionality in IG</td>
</tr>
<tr>
<td>Baier et al (2009)</td>
<td>RCT</td>
<td>n=77</td>
<td>Elderly population</td>
<td>76.0 ± 1.6 (38/39)</td>
<td>12 months</td>
<td>DXA</td>
<td>YES</td>
<td>IG: HMB 2g-3g + arginine + lysine CG: placebo</td>
<td>↑ LMB in IG</td>
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<td></td>
<td>Strength→ no change, Physical function→ no change</td>
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<td></td>
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<td></td>
<td>Quality of life → no change</td>
</tr>
<tr>
<td>Hsieh et al (2010)</td>
<td>RCT</td>
<td>n=79</td>
<td>Bed ridden elderly receiving tube feeding</td>
<td>IG:78.8 ± 9.7 CG: 78.3 ± 7.4 (43/36)</td>
<td>2 weeks (+ 39 patients 2 weeks more)</td>
<td>NO</td>
<td>NO</td>
<td>IG: EN+HMB 2g/d CG : EN</td>
<td>↑ weight, BMI and circumferences in IG</td>
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<td></td>
<td></td>
<td>No changes in CG</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No measurement body composition.</td>
</tr>
<tr>
<td>Deutz et al (2013)</td>
<td>RCT</td>
<td></td>
<td>Healthy older adults</td>
<td>67.1 ± 1.6 (4/15)</td>
<td>10 days bed rest + rehabilitation for 8 wk</td>
<td>YES</td>
<td>IG: HMB 3g/day CG: placebo</td>
<td>↓ LBM in CG</td>
<td>HMB prevented decline in LBM Female significant difference</td>
</tr>
</tbody>
</table>

- Higher sample sizes.
- 1 long term study.
- Not in all the studies measurement of body composition or strength.
- Different dosage regimens.
- No diagnosis sarcopenia/presarcopenia/frailty
- **No significant changes** in body composition/variable results in strength

Adapted and modified to Malafarina (JAMDA 2013)
Adapted and modified to Fitschen et al (Nutrition 2013)
How can specific amino acids and exercise regimens be combined?
# ESSENTIAL AMINO ACIDS AND HMB WITH EXERCISE

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Design</th>
<th>Sample size (n)</th>
<th>Type of patients</th>
<th>Population age (y) Mean ± SD</th>
<th>Sex (m/w)</th>
<th>Duration (wk)</th>
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<th>Strength measurement</th>
<th>Quantity and type of intervention</th>
<th>Main Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baldi et al (2010)</td>
<td>RCT</td>
<td>n=28</td>
<td>Elderly with COPD and loss BW 6 month previous</td>
<td>73.1 ±6 IG 70.1±6 CG (20/8)</td>
<td>12 weeks</td>
<td>DXA</td>
<td>NO</td>
<td>EEA (leucine): 200 ml/twice a day CG: placebo Both groups: exercise rehabilitation</td>
<td>↑ Fat free mass in intervention group (significant); ↑ Body weight</td>
<td></td>
</tr>
<tr>
<td>Kim et al (2012)</td>
<td>RCT</td>
<td>n= 155</td>
<td>Sarcopenic older women</td>
<td>&gt; 75 years</td>
<td>12 weeks</td>
<td>BIA</td>
<td>SI</td>
<td>4 groups; 1)EEA (leucine + exercise 2)Exercise 3) EEA supplements 4)Health education</td>
<td>↑ walking speed in all 3 interventions. ↑ leg mass (1 and 2) ↑ strength group 1</td>
<td></td>
</tr>
<tr>
<td>Vukovich et al (2001)</td>
<td>RCT (db)</td>
<td>n=31</td>
<td>Healthy older adults</td>
<td>70 ±1 (15/16)</td>
<td>8 wk</td>
<td>DXA</td>
<td>YES</td>
<td>IG: HMB 3g/day CG: placebo + exercise training</td>
<td>↑ FFM IG vs CG ↑ strength in IG No significant differences</td>
<td></td>
</tr>
<tr>
<td>Stout et al (2014)</td>
<td>RCT (db) Two Phases</td>
<td>n P1=43 n P2=36</td>
<td>Healthy adults</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Phase 2: Total leg and arm leg mass ↑ in both groups (↑ placebo), ↑ In strength in both groups</td>
</tr>
</tbody>
</table>

- ↑ FFM and strength with combination
- No significant differences in HMB studies
What is the evidence available on Vitamin D?
VITAMIN D

**STATEMENT 1a:** Clinicians are strongly advised to recommend vitamin D supplementation of at least 1,000 international units (IU)/d, as well as calcium supplementation, to community-dwelling older adults (≥65) to reduce the risk of fractures and falls.

**STATEMENT 2:** Clinicians are strongly advised to recommend vitamin D supplementation of at least 1,000 IU/d with calcium to older adults residing in institutionalized settings to reduce the risk of fracture and falls.

- Systematic review of Vit D supp in strength and mobility.
- Small but significant effect in muscle strength.
- Not improvement in mobility.
- ref: PP040-MON
# PROTEIN SUPPLEMENTATION AND VITAMIN D

<table>
<thead>
<tr>
<th>Authors (year)</th>
<th>Design</th>
<th>Sample size (n)</th>
<th>Type of patients</th>
<th>Population age (y) Mean ± SD Sex (m/w)</th>
<th>Duration (wk)</th>
<th>Measurement of body composition</th>
<th>Strength measurement</th>
<th>Quantity and type intervention</th>
<th>Main Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuller JC et al (2011)</td>
<td>Cohort study</td>
<td>n=77</td>
<td>Elderly population</td>
<td>76.0 ±1,6 (38/39)</td>
<td>52 wk</td>
<td>BIA</td>
<td>YES</td>
<td>IG: HMB 2g-3g + arginine + lysine CG: placebo</td>
<td>↑FFM significantly in Vit D &gt; 30 ng/ml in IG, ↑Strength in Vit D &gt; 30 ng/ml in IG</td>
</tr>
<tr>
<td>Neelemant et al (2012)</td>
<td>RCT</td>
<td>n=210 Dn=30</td>
<td>Hospitalized malnourished elderly</td>
<td>IG: 74.6 ± 9.7 CG: 74.4 ± 9.3 (94/116)</td>
<td>12 wk</td>
<td>BIA</td>
<td>YES</td>
<td>IG: enriched diet /ONS + calcium-V.D sup. CG: usual care</td>
<td>↓body weight No differences in changes FFM, No differences in strength measurements ↓Nº of falls in IG (p=0.02)</td>
</tr>
</tbody>
</table>

- Study with leucine and Vit D enriched supplement.
- 380 patients with low physical function.
- Improvements in strength and functionality.
- Ref: OP022
SPECIFIC SUPPLEMENTS FOR PATIENTS WITH SARCOPENIA

New perspectives?
OMEGA-3 FATTY ACIDS

Omega-3 fatty acids

Anabolic stimulus
(AA administration, physical exercise...)

↑ MPS and muscle mass
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Intervention</th>
<th>Duration</th>
<th>Key Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith et al, 2011</td>
<td>16 healthy older adults</td>
<td>IG: Omega-3 FA, CG: corn oil</td>
<td>8 weeks</td>
<td>↑ Protein synthesis in CG with adequate anabolic stimulus</td>
</tr>
<tr>
<td>Rodacki et al, 2012</td>
<td>45 older women</td>
<td>IG: omega-3 FA (2 g/d) + exercise training, CG: exercise training alone.</td>
<td>12 weeks</td>
<td>Additional ↑ in muscle strength and functional capacity</td>
</tr>
<tr>
<td>Hutchins-Wise et al, 2013</td>
<td>128 post-menopausal women</td>
<td>IG: omega-3 FA (1 g/d), CG: olive oil</td>
<td>6 months</td>
<td>Increased DHA in IG, ↑ walking speed and ↓ frailty</td>
</tr>
</tbody>
</table>
CAUTIONS

- **High protein use**
  - Risk of ↓ Renal function:
    - Normal Renal function: Maintain dosage but periodic control of Renal function
    - Patients with Kidney impairment: use with caution

- **Vitamin D supplementation**
  - Risk of nephrocalcinosis and renal failure: Periodic control of renal function.
  - Review current pharmacological treatments to avoid duplicities with Vitamin D supplements.

- **Sarcopenic obesity**
  - Caloric restriction avoid ↑ fat mass.
CONCLUSIONS

- Supplements enriched with leucine or β-HMB, omega-3. Limited evidence, more studies are needed.
- Vitamin D. The studies support its use in case of deficiency.
- Promising area. Combination of all nutrients.
- Combination of leucine and vitamin D. Improvement in strength and functionality.
- Combination of specific amino acid/omega-3 and exercise. Good results.

- Not enough evidence of:
  - Optimal dosage of each nutrient.
  - Optimal duration of supplementation.
  - Synergistic effect of nutrients.
  - Best timing of supplementation.

- Few studies realized in sarcopenia or frailty patients.
- Long-term studies.
- Use other outcomes. ADL, IADL, physical function (SPPB), quality of life.
SPECIFIC SUPPLEMENTS FOR OLDER PATIENTS WITH PRESSURE ULCERS
Older patients with decreased mobility, limited mental status, and increased skin friction have an increased risk of developing pressure ulcers (PU). 45% of PUs are potentially preventable. Some evidence indicates that poor nutrition increases the incidence and severity of PU. Different nutritional strategies have been investigated: increasing the quantity of proteins, using trace elements (Zinc), antioxidants, and specific amino acids (Arginine).
Recent review

- Use specific formulas to **PREVENT PU**.
  - Two studies (no specifically for older patients)
    - Craig 1998: 34 people with DMII and nasogastric tube. Disease specific formula (modified-fat) vs standard high-carbohydrate feeding → No differences in PU development.
    - Theilla 2007: 100 intensive care patients. Formula was enriched with EPA and antioxidants (vitamin A, C, and E) → No differences between the two groups in PU development.
Recent review

**Nutritional interventions for preventing and treating pressure ulcers (Review)**

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**Use specific formulas to TREAT PU. Arginine-and micronutrients enriched formula**

<table>
<thead>
<tr>
<th>Study</th>
<th>Patients</th>
<th>Duration</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benati, 2001</td>
<td>36 patients with severe cognitive impairment and PU.</td>
<td>2 weeks</td>
<td>Preliminary data: people treated with arginine supplement ↑ improvement than the others groups</td>
</tr>
<tr>
<td>Desneves 2005</td>
<td>16 patients (no specifically older patients) with PU 2, 3 and 4 grade</td>
<td>3 weeks</td>
<td>Difference in PUSH scores was 4,4 in favor arginine supplement</td>
</tr>
<tr>
<td>Cereda 2009</td>
<td>28 elderly patients with stages II, III and IV PU.</td>
<td>12 weeks</td>
<td>Better healing in supplemented group and reduction ulcer size</td>
</tr>
<tr>
<td>Van Anholt 2010</td>
<td>43 non-malnourished patients with III and IV stage PU (mean age &gt; 70 years)</td>
<td>8 weeks</td>
<td>No differences in PUSH scores and in ulcer size</td>
</tr>
</tbody>
</table>
Figure 5. Forest plot of comparison: 4 Treatment with mixed nutritional supplements: arginine-enriched mixed nutritional supplement versus standard hospital diet, outcome: 4.1 PUSH score.

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerqua 2006</td>
<td>-8.1</td>
<td>2.7</td>
<td>13</td>
<td>-3.3</td>
<td>2.4</td>
<td>15</td>
<td>72.2%</td>
<td>-2.80 [-4.71, -0.89]</td>
</tr>
<tr>
<td>Desreves 2005</td>
<td>2.8</td>
<td>1.24</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>4</td>
<td>28.1%</td>
<td>-4.40 [-7.57, -1.23]</td>
</tr>
<tr>
<td>van Ameloot 2010</td>
<td>-5.28</td>
<td>2.11</td>
<td>22</td>
<td>5.98</td>
<td>2.69</td>
<td>21</td>
<td>17.7%</td>
<td>-0.70 [-13.16, 11.18]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>40</td>
<td>40</td>
<td>100.0%</td>
<td>-3.18</td>
<td>4.80</td>
<td>1.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Ch²= 8.00, df= 2 (P = 0.05), I² = 0%</td>
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<tr>
<td>Test for overall effect: Z = 3.85 (P = 0.0001)</td>
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</tbody>
</table>

Figure 6. Forest plot of comparison: 4 Treatment with mixed nutritional supplements: arginine-enriched mixed nutritional supplement versus standard hospital diet, outcome: 4.3 Ulcer size.

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Mean</th>
<th>SD</th>
<th>Total</th>
<th>Weight</th>
<th>Mean Difference IV, Random, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerqua 2008</td>
<td>7.01</td>
<td>8.35</td>
<td>13</td>
<td>12.28</td>
<td>9.02</td>
<td>15</td>
<td>71.7%</td>
<td>-5.27 [-11.89, 1.35]</td>
</tr>
<tr>
<td>van Aanholt 2010</td>
<td>1.95</td>
<td>17.59</td>
<td>22</td>
<td>3.34</td>
<td>17.64</td>
<td>21</td>
<td>26.3%</td>
<td>-1.49 [-12.02, 9.04]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>35</td>
<td>36</td>
<td>100.0%</td>
<td>-4.20</td>
<td>9.80</td>
<td>1.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heterogeneity: Tau²= 0.00, Ch²= 0.35, df = 1 (P = 0.55), I² = 0%</td>
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</tr>
<tr>
<td>Test for overall effect: Z = 1.47 (P = 0.14)</td>
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</tbody>
</table>

Test for subgroup differences: Not applicable
SPECIFIC SUPPLEMENTS FOR OLDER PATIENTS WITH PU

- Studies vary in terms of interventions, outcome measurements and follow-up.
- Several studies included few patients.
- Follow-up time short.
- Few studies specifically for older populations.
- Risk of bias.

- Specific nutrition reduce development of PU **No clear evidence.**
- Use specific supplements (ARGININE) in treatment of PU ↑ PUSH scores and reduce ulcer size when studies were combined. **May be used**

- More clinical studies are needed
  - ↑ sample size
  - better methodology
  - long term studies
LOW-VOLUME/TEXTURE MODIFIED ORAL NUTRITIONAL SUPPLEMENTS
LOW VOLUMES / TEXTURE MODIFIED SUPPLEMENTS

- **Low volume/dense supplements**
  - ↑ compliance
  - ↑ nutritional status
  - ↑ functional capacity
  - ↑ quality of life

- **Texture modified oral supplements**
  - Few studies have researched the use of these supplements.
  - Studies in dysphagia patients conducted with enteral nutrition and tube feeding.
  - Further research are needed.
Specific supplement specially thinking for elderly should contain...

- Equilibrate calories (↓ for sarcopenic obesity)
- ↑ quantity of proteins:
  - Leucine or derivates (HMB)
  - Arginine
- Low dose omega three fatty acids (1-2 g/d)
- Vitamin D (700 UI/d) + Calcium
- Zinc
- Low-volume and/or texture modified
- Others.......
We continue searching...

...we are getting closer
MANY THANKS