Feeding Your Wound: Fuel to Heal

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Objectives

1. Examine the building block of nutrition (macronutrients and micronutrients) that dominate healing & discuss practical nutrition strategies for healing wounds

2. Apply the 2014 National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel/Pan Pacific Pressure Injury Alliance nutrition guidelines into practice

Pathogenesis of Pressure Injuries

Adapted from: "ABC of Wound Healing" Blackwell Publishing, 2006
NPUAP Terminology Change

- April 2016 NPUAP consensus conference announced terminology change from pressure ulcer to pressure injury & validated new terminology, which more accurately describes pressure injury in intact and ulcerated skin.
- Previous staging system described both Stage 1 & Deep Tissue Injury as injured intact skin and the other stages described open ulcers.
- There has been confusion because the definitions for each of the stages referred to the injuries as “pressure ulcers”.

Pressure Injury

**Pressure Injury:**
A pressure injury is localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear. The tolerance of soft tissue for pressure and shear may also be affected by microclimate, nutrition, perfusion, co-morbidities and condition of the soft tissue.

www.npuap.org

Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT)

- **Goal**: reform post acute care (PAC) payments & reimbursement while ensuring continued beneficiary access to the most appropriate setting of care.
- **Measure Domain**: skin integrity & changes in skin integrity
- **Outcome Measure**: Percent of residents or patients with pressure ulcers that are new or worsened.
Improving Medicare Post-Acute Care Transformation Act of 2014 (IMPACT)

- **Target Date** Oct. 2016: long term care hospitals (LTCHs), inpatient rehabilitation facilities (IRFs,) and skilled nursing facilities (SNFs) to report standardized assessment data for the skin integrity and changes in skin integrity Quality Measure Domain (QMD)

- **QMD reports**: percent of patients/ residents with Stage 2-4 pressure ulcers that are new or worsened since admission.

Rationale for Pressure Injury(ulcer) QM

- Linked to malnutrition
- Increases mortality in elderly, 70% occur in adults > 70
- Longer hospital stays ↑ cost of care
- Cause discomfort & pain
- Can lead to septicemia & osteomyelitis
- Pressure injuries are high cost adverse condition across all settings
- Burden of litigation associated with pressure injuries

Quality Measure Description

- SNF Data: data from MDS 3.0 & measure is restricted to short-stay residents defined as ≤ 100 days in SNF
- LTCH Data: LTCH Care Data Set is for all patients
- IRF Data: IRF-PAI for IRF patients & limited to Medicare part A and C patients
- Data affects payment determination beginning 2018
- Nutrition interventions should be part of prevention & healing strategy for QMD
Age Related Skin Changes

- Flattening of the dermal epidermal junction
- Slower cell turnover, decreased elasticity
- Thinning of subcutaneous layers,
- Decrease in overall muscle mass,
- Decreased intradermal vascular perfusion and oxygenation.

Addressing the Skin Integrity QM Domain

Nutrition Guidelines

2014 National Pressure Ulcer Advisory Panel,
European Pressure Ulcer Advisory Panel,
Pan Pacific Pressure Injury Alliance Pressure Ulcer Prevention and Treatment Guidelines

Nutrition Care Process

NPUAP/EPUAP/PPPI
A Pressure Ulcer Prevention and Treatment Guidelines
Goal of Guideline

• The goal of this international collaboration was to develop evidence-based recommendations for the prevention and treatment of pressure ulcers that could be used by health professionals throughout the world.
• Produced by the Guideline Development Group (GDG).
• Each section had a small work group (SWG) representatives from each organization.

Strength of Recommendations (SOR)
Assists Health Professionals Prioritize Interventions

- Strong positive recommendation: definitely do it
- Weak positive recommendation: probably do it
- No specific recommendation
- Weak negative recommendation: probably don’t do it
- Strong negative recommendation: definitely don’t do it
Malnutrition

- Increases morbidity and mortality.
- Decreases function and quality of life.
- Increases frequency and length of hospital stay.
- Increases health care costs.


Inflammation and Malnutrition

Inflammation (d/t infection, injury, surgery, etc.): an important underlying factor that increases risk for malnutrition.

White J, J Acad Nutr Diet 2012:112:730-730

Malnutrition and Pressure Injuries

- Pre-existing malnutrition/weight loss increased the odds of developing a PU 3.8 times. (2010)

Fry

- Australia, odds ration of having a pressure ulcer are higher with malnutrition in acute and LTC. (2010)

Banks

- Home care study in Japan: ≥ 65, rate of malnutrition 58.7% with pressure ulcers compared to 32.6% without them. (2010)

Iizaka
Nutrition Screening, Assessment, and Care Planning

Nutrition Screening

1. Screen nutritional status for each individual at risk of or with a pressure ulcer:
   – at admission to a health care setting;
   – with each significant change of clinical condition; and/or
   – when progress toward pressure ulcer closure is not observed. (Strength of Evidence = C, Strength of Recommendation - SOR = Probably do it)

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Nutrition Screening

2. Use a valid and reliable nutrition screening tool to determine nutritional risk. (Strength of Evidence = C, SOR = Probably do it)

3. Refer individuals screened to be at risk of malnutrition and individuals with an existing pressure ulcer to a registered dietitian or an interprofessional nutrition team for a comprehensive nutrition assessment. (Strength of Evidence = C; SOR = Probably do it.)

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**Nutrition Screening Tool**

Quick and Easy → Acceptable → Validated

**Validated Screening Tools**

- **MST**
  - Malnutrition Valid and reliable for use in acute care and ambulatory care to identify malnutrition
  - Validated in acute care and ambulatory care (Ferguson, M et al. 1999)

- **MNA®**
  - Mini-Nutritional Assessment
  - Validated in individuals/Pas Langkamp-Henken et al. (2005)
  - Validated and easy to use in older adults (Paudlia 2012)

- **MUST**
  - Malnutrition Universal Screening Tool
  - To identify risk of undernutrition (Poulia et al. 2012)
  - Validated for use in older adults admitted to acute care

- **SNAQ**
  - Short Nutrition Assessment Questionnaire
  - Acute care, residential care and community adults
  - Neelemant et al. (2008)

**Mini Nutritional Assessment®**

- **MNA®**
  - Validated and easy to use in geriatric patients
  - Acute care, hospital based ambulatory care, LTC

- [http://www.mna-elderly.com](http://www.mna-elderly.com)
Malnutrition Screening Tool (MST)

**STEP 1: Screen with the MST**
- Have you recently lost weight without trying?
  - Yes __
  - No __
- If yes, how much weight have you lost?
  - >10 kg __
  - 5-10 kg __
  - 1.5-4.4 kg __
  - <1.5 kg __

- Have you been eating poorly because of decreased appetite?
  - Yes __
  - No __

**STEP 2: Score to Determine Risk**

- MST = 0 OR 1 NOT AT RISK
  - Falling and will take 1-2 weeks to regain
- MST = 2 OR MORE AT RISK
  - Rapidly improved nutrition intake, mobility, physical activity

**STEP 3: Intervene with nutritional support for your patient at risk of malnutrition.**

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Malnutrition Universal Screening Tool

**MUST**
- To identify risk of undernutrition (BAPEN, 2008)

- BMI
- Weight loss past 3-4 months
- Acute disease (no intake >5 days)

[http://www.bapen.org.uk/must_tool.html](http://www.bapen.org.uk/must_tool.html)

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Short Nutritional Assessment Questionnaire

**SNAQ**
- Did you lose weight unintentionally? More than 6 kg in the last 6 months
- Did you experience a decreased appetite over the last month?
- Did you use supplemental drinks or tube feeding over the last month?

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- no intervention
- moderately malnourished, nutritional intervention
- severely malnourished, nutritional intervention and treatment dietician
**Braden Scale: Nutrition Subscores**

<table>
<thead>
<tr>
<th>Sensory Perception</th>
<th>1 Completely limited</th>
<th>2 Very limited</th>
<th>3 Slightly limited</th>
<th>4 No impairment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>1 Constantly moist</td>
<td>2 Very moist</td>
<td>3 Occasionally moist</td>
<td>4 No impairment</td>
</tr>
<tr>
<td>Activity</td>
<td>1 Bedfast</td>
<td>2 Chair</td>
<td>3 Limited</td>
<td>4 No limitation</td>
</tr>
<tr>
<td>Mobility</td>
<td>1 Completely immobile</td>
<td>2 Limited</td>
<td>3 Limited</td>
<td>4 No limitation</td>
</tr>
<tr>
<td>Nutrition</td>
<td>1 Very poor</td>
<td>2 Probably inadequate</td>
<td>3 Adequate</td>
<td>4 Excellent</td>
</tr>
<tr>
<td>Friction &amp; Shear</td>
<td>1 Problem</td>
<td>2 Potential problem</td>
<td>3 No apparent problem</td>
<td>4</td>
</tr>
</tbody>
</table>

**Comprehensive Nutrition Assessment**

Academy’s Nutrition Care Process

Nutrition:
1. Assessment
2. Diagnosis
3. Intervention
4. Monitoring and Evaluation

**Nutrition Assessment**

- **Medical Hx, Physical Exam**
  - Diagnosis/recent changes in condition (depression)
  - Medications
  - Risk or S/S of malnutrition, dehydration

- **Diet History, Food Intake**
  - Adequacy of food/fluid intake compared to needs
  - Chewing, swallowing, self feeding, GI issues

- **Body Composition**
  - Height, weight, wt. history, UWL (>5% in 30 days or >10% in 180 days), BMI ≤19
  - Insidious weight loss
Nutrition Assessment

Current Interventions
- Food or dining related interventions
- Oral nutrition supplements
- Nutrition support

Interviews
- with resident, family and/or staff
- Acceptance to interventions
- Compare goals to outcomes

Nutrition Focused Physical Examination
- Overall appearance/indicators of PEM
- Oral examination
- Skin examination

Algorithm for Prevention of PUs

Trigger conditions: UWL swallowing problems, poor oral intake, immobile, swallowing concerns, low PU risk assessment score, risk of malnutrition per validated nutrition screen.

Screen & Assess: using validated screening tool & refer to registered dietitian or nutrition team to assess & document nutrition & fluid needs.

Assess ability to meet nutritional needs (food, fluid, oral supplements, enteral/parenteral feedings).

SOE = C; SOR= Definitely do it

Nutrition Assessment

1. Assess weight status for each individual to determine weight history and significant weight loss from usual body weight (>5% change in 30 days or >10% in 180 days).
   SOE = C; SOR= Probably do it

2. Assess the individual’s ability to eat independently.
   SOE = C; SOR= Definitely do it

3. Assess the adequacy of total nutrient intake (food, fluid, oral supplements, enteral/parenteral feedings).
   SOE = C; SOR= Definitely do it
Dietary Intake

- Depression affects appetite of 30% of adult outpatients.
- Loss of appetite related to high risk of malnutrition.
- Increases risk of poor wound healing.
- Decreased ability to eat independently.
- ↑ Risk for undernutrition and delayed healing.

Horn 2004; Gilmore 1995

What about Labs?

No lab test can specifically determine an individual’s nutritional status.

- Serum protein levels may be affected by metabolic stress, inflammation, renal function, hydration and other factors.

Inflammation and Stress → Release of Cytokines

- Decreased nitrogen retention
- Decreased albumin synthesis
- Extravasation of albumin from intravascular spaces
- Decreased circulating levels of albumin and cholesterol

Cytokines
- Interleukin – 1
- Interleukin – 2
- Interleukin – 6
- Tumor necrosis factor α
- Ciliary neurotrophic factor

Source: Council for Nutrition Clinical Strategies in LTC

Interleukin – 1
Interleukin – 2
Interleukin – 6
Tumor necrosis factor α
Ciliary neurotrophic factor
Care Planning

1. Develop an individualized nutrition care plan for individuals with or at risk of a pressure ulcer. (SOE = C, SOR = Probably do it)

1. Follow relevant and evidence-based guidelines on nutrition and hydration for individuals who exhibit nutritional risk and who are at risk of pressure ulcers or have an existing pressure ulcer. (SOE=C, SOR= Probably do it)

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General Recommendations

Use your clinical judgment based on a thorough medical and nutritional assessment to make appropriate individualized recommendations

Individualized care plan should focus on:
- improving and/or maintaining overall nutritional status
- acceptance of nutrition interventions
- clinical outcomes

Plan of Care for PU Treatment

UWL of >5% in 30 days, current wt. 140#, eats less than 50% of 2gm sodium diet, MNA screen 7 indicates malnutrition, Stage 3 PU on coccyx

Refer to registered dietitian or nutrition team to reassess, document malnutrition & implement treatment plan
Responsive increase in metabolic rate which increases caloric needs (triggered by PrU, infection, severe illness, trauma, etc.)

Energy is essential for pressure ulcer healing

Need to provide adequate calories to promote anabolism, nitrogen and collagen synthesis

Creda 2011, Yamamoto 2009

What Does the Evidence Suggest?

Energy Intake

General Recommendations: Nutrition Interventions for Pressure Injuries

Responsive increase in metabolic rate which increases caloric needs (triggered by PrU, infection, severe illness, trauma, etc.)

Energy is essential for pressure ulcer healing

Need to provide adequate calories to promote anabolism, nitrogen and collagen synthesis

Creda 2011, Yamamoto 2009

What Does the Evidence Suggest?

Energy Intake

Responsive increase in metabolic rate which increases caloric needs (triggered by PrU, infection, severe illness, trauma, etc.)

Energy is essential for pressure ulcer healing

Need to provide adequate calories to promote anabolism, nitrogen and collagen synthesis

Creda 2011, Yamamoto 2009
**Energy Intake**

- Provide individualized energy intake based on underlying medical condition and level of activity. *(SOE = B, Probably do it)*
- Provide 30 to 35 kcalories/kg body weight for adults with a pressure ulcer who are assessed as being at risk of malnutrition. *(SOE = C, SOR= Definitely do it)*
- Adjust energy intake based on weight change or level of obesity. Adults who are underweight or who have had significant unintended weight loss may need additional energy intake. *(SOE = C, SOR= Definitely do it)*

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**Energy Intake**

- Revise and modify/liberalize dietary restrictions when limitations result in decreased food and fluid intake. These adjustments should be made in consultation with a medical professional and managed by a registered dietitian whenever possible. *(SOE = C, SOR= Probably do it)*
- Offer fortified foods and/or high calorie, high protein oral nutritional supplements between meals if nutritional requirements cannot be achieved by dietary intake. *(SOE = B, SOR= Definitely do it)*

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**What Does the Evidence Suggest for Optimal Protein**

- Increased protein linked to improved PU healing rates
- Based on metabolic changes & loss of muscle mass with aging protein 1.2-1.5g/kg BW is recommended

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Lean Body Mass is Essential for:

- Muscle Strength
- Immunity
- Wound Healing
- Skin Integrity
- Organ Function

Loss of Lean Body Mass Counts

<table>
<thead>
<tr>
<th>Loss of LBM</th>
<th>Complications</th>
<th>Associated Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>↓immunity, ↑infections</td>
<td>10%</td>
</tr>
<tr>
<td>20%</td>
<td>↓healing, weakness, infection</td>
<td>30%</td>
</tr>
<tr>
<td>30%</td>
<td>too weak to sit, pressure ulcers, pneumonia, no healing</td>
<td>50%</td>
</tr>
<tr>
<td>40%</td>
<td><strong>DEATH,</strong> usually from pneumonia</td>
<td>100%</td>
</tr>
</tbody>
</table>

The Non-healing Chronic Wound

Failure to Heal by 12 Weeks

- The Non-healing Wound: ↑Catabolism, ↓Anabolism, Energy, Protein Synthesis
- The Healing Wound: ↑Anabolism, ↓Catabolism, Energy, Protein synthesis

Wound contraction
Ensure Adequate Protein Intake

15%-38% of older men eat less than the RDI for protein.

27%-41% of older women eat less than the RDI for protein.


What Does the Evidence Suggest for Optimal Protein Intake for Older Adults

- Protein spread equally between breakfast lunch and dinner (Paddon-Jones 2009)
- If needed, additional protein supplementation should given between meals (Wilson MM 2002)

Protein Distribution

A. Optimal Protein Distribution

<table>
<thead>
<tr>
<th>Meal</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>~20 g</td>
</tr>
<tr>
<td>Lunch</td>
<td>~20 g</td>
</tr>
<tr>
<td>Dinner</td>
<td>~20 g</td>
</tr>
</tbody>
</table>

B. Skewed Protein Distribution

<table>
<thead>
<tr>
<th>Meal</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>~50 g</td>
</tr>
<tr>
<td>Lunch</td>
<td>~50 g</td>
</tr>
<tr>
<td>Dinner</td>
<td>~50 g</td>
</tr>
</tbody>
</table>

(Maximum protein synthesis)
Protein Intake

• Provide adequate protein for positive nitrogen balance for adults assessed to be at risk of a pressure ulcer. (SOE = C, SOR= Probably do it)

• Offer 1.25 to 1.5 grams protein/kg body weight daily for adults with an existing pressure ulcer who is assessed to be at risk of malnutrition when compatible with goals of care, and reassess as condition changes. (SOE = C, SOR= Probably do it)

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Protein Intake

• Offer high calorie, high protein nutritional supplements in addition to the usual diet to adults with nutritional risk and pressure ulcer risk, if nutritional requirements cannot be achieved by dietary intake. (SOE = A, SOR= Probably do it)

• Assess renal function to ensure that high levels of protein are appropriate for the individual. (SOE = C, SOR= Definitely do it)

  – Clinical judgment is required to determine the appropriate level of protein for each individual, based on the number of pressure ulcers present, overall nutritional status, co-morbidities, and tolerance to nutritional interventions.

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Fluids: What Does the Evidence Suggest?

Dehydration is a risk factor for pressure ulcer development

Hydration needs must be met to assure proper prevention and healing
Hydration

1. Provide and encourage adequate daily fluid intake for hydration for an individual assessed to be at risk of or with a pressure ulcer. This must be consistent with the individual’s comorbid conditions and goals. (SOE = C, SOR= Definitely do it)

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Hydration

2. Monitor individuals for S/S dehydration: changes in weight, skin turgor, urine output, elevated serum sodium and/or calculated serum osmolality. (SOE = C, SOR= Probably do it)

3. Provide additional fluid for individuals with dehydration, elevated temp, vomiting, profuse sweating, diarrhea or heavily draining wounds. (SOE = C, SOR= Definitely do it)

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Fluids

Needs increase according to insensible water loss

Needs may decrease for CHF, renal failure
Consider TAPS

- Turn
- Align
- Position
- Sips

1 mL/calorie consumed
30 mL/kg BW/day

Hydration Interventions

- Add variety of beverages
- Glass of water with meals
- Hydration pass & juice machines with resident access
- Hydration in rehab department

What Does the Evidence Suggest?

Micronutrients
Vitamins and Minerals

- Provide/encourage an individual with a pressure ulcers to consume a balanced diet that includes good sources of vitamins and minerals. (SOE = B, SOR = Definitely do it)
- Provide/encourage an individual with a pressure ulcer to take vitamin and mineral supplements when dietary intake is poor or deficiencies are confirmed or suspected. (SOE = B, SOR = Probably do it)

Micronutrients

- Most nutrient needs can be met through a healthy diet
- Individuals with PUs may not be consuming an adequate diet
- No evidence to support vitamin C above the RDI unless a deficiency is diagnosed or suspected
Zinc

- No research to show zinc supplementation improves healing
- When clinical signs of zinc deficiency are present, zinc should be supplemented at <40 mg elemental zinc/day (UTL)
- Doses >40 mg/day can adversely affect copper status and possibly result in anemia

Plan of Care for PU Treatment

- UAP <5% in 30 days, current wt. <50% of ideal, sodium deficit, MNA screen 7 indicates malnutrition, Stage 3 PU on coccyx
- Refer to registered dietician or dietitian in nine to assess, document malnutrition, implement treatment plan
- Refer to registered dietitian or dietitian, assess calorie 30-35 Kcal/kg ABW, protein 1.25-1.5 g/kg ABW, fluid 1 mL/cal, modify diet to reg, recommend multivitamin/minerals, offer high protein oral supplement between meals

Obesity and Pressure Injuries
Obese Individuals

- There are no evidence based guidelines available related to the nutritional needs of the obese person with pressure injuries
- Adequate calories, protein, fluids and nutrients are needed for healing
  - General consensus is that diets should be liberalized to promote healing
  - Once the PrI is completely healed, diet restrictions may be gradually implemented as needed
- Monitor skin integrity and coordinate with RDN (ongoing)

Alternate Food Sources of Protein

- 8 oz. Greek yogurt
  - 140 cal
  - 14 gms pro
- Half sandwich
  - 8 oz. 2% milk
  - 120 cal
  - 18 gms pro
- High protein bar
  - 210 cal
  - 12 gms pro

Plan of Care for Chronic Non-healing PU

- Slowing regaining wt., eats 75% of meals, 100% of supplement, stage 4 PrI on coccyx & no progress
  - Offer high protein supplement fortified with arginine & micronutrients between meals
- Refer to registered dietitian or nutrition team to reassess, document & revise treatment plan
- Re-assess, interview individual, continue previous calorie & protein levels, fluid offered between meals, discontinue multivitamin/mineral, offer high protein oral supplement fortified with arginine & micronutrients between meals
Protein Intake

7. Supplement with high protein, arginine and micronutrients for individuals with a pressure ulcer Category/Stage III or IV or multiple pressure ulcers when nutritional requirements cannot be met with traditional high calorie and protein supplements. (SO E = B, SOR= Probably do it)

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CUBE Trial

A multi-country, randomized, placebo-controlled trial to demonstrate the efficacy of a specific ‘arg+ONS-spec.’ on pressure ulcer healing in non-malnourished patients with stage III-IV ulcers

Ready-to-drink, high-protein, arginine enriched nutritional supplement Containing per 200-ml serving:
- 20 g protein
- 3 g L-arginine
- 250 kcal
- Vitamins and micronutrients including:
  - 250 mg vitamin C
  - 38 mg vitamin E (α-TE)
  - 9 mg zinc
  - 1.5 mg carotenoids

Earlier Reduction in Ulcer Size from Baseline

With specific oral nutritional support a significant reduction in ulcer size was reached 2 weeks earlier compared to the control group.
- First time-point with a significant reduction compared to baseline
- Arg+ONS-spec. = day 21, P=0.011
- Control group = day 35, P= 0.019
- Means ± SEM; data adjusted for center
**Oligo Element Trial Study Group**

- Multicenter, RCT to evaluate supplementation with arginine, zinc & antioxidants in high-calorie, high-protein formula to improve PrU healing
- 200 malnourished patients with stage II, III, and IV PrUs
- 8 week trial – LTC and home care in Italy
- Majority of PrUs on sacrum


**Malnourished criteria**

- UWL – 5% (30 days) and 10% 3 months
- BMI < 20 age < 65 and < 21 > 65
- Food intake (<60% of estimated total daily energy requirements in the week before the study)
- Both groups received a 400 mL high-calorie, high-protein formula (100 mL, 4x/day)
- Standard wound care for all

**Nutritional Supplement in 100mL**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Standard: Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein 10 grams</td>
<td>Protein 10 grams</td>
</tr>
<tr>
<td>Arginine-L 1.5</td>
<td>Arginine-0</td>
</tr>
<tr>
<td>Zinc 4.5 mg</td>
<td>Zinc 2.3 mg</td>
</tr>
<tr>
<td>Copper 675 mcg</td>
<td>Copper 338 mcg</td>
</tr>
<tr>
<td>Vitamin C 125 mg</td>
<td>Vitamin C 19 mg</td>
</tr>
<tr>
<td>Vitamin E 19.0 mg</td>
<td>Vitamin E 2.3 mg</td>
</tr>
</tbody>
</table>
Conclusion

• 69.9% in intervention formula group had 40% or greater reduction in PU size compared to 54.1% in control
• The efficacy of these nutrients in wound healing is likely synergistic because there is no evidence supporting an independent effect when given alone
• This nutritional intervention may be beneficial when added to optimized local wound care for the treatment of pressure ulcers in malnourished patients.

Plan of Care for Chronic Non-healing PU

Recent stroke & dysphagia, NPO status, wound healing per PUSH score, Refer to registered dietitian or nutrition team to reassess, document & revise treatment plan

Re-assess, interview individual & caregivers, enteral nutrition discussed & initiated, protein requirement not met with formula & modular protein added BID

Nutrition Support

Consider nutritional support (enteral or parenteral nutrition) when oral intake is inadequate. This must be consistent with the individual’s goals. (Strength of Evidence = C, SOR= Probably do it)
Nutrition Support

- NPO >3-5 days
- Hydration with IVs does not supply nutrients
- Places individual at risk of undernutrition and pressure injury development

Enteral Feedings

Determine if patient actually receives TF as prescribed:

- Is TF given as ordered (product, mLs/hr)?
- Are flushes given as ordered (flushes, flushes with meds)?
- Is the strength correct?
- Is the individual tolerating the feeding?
- Round the clock or intermittent (turned off)?

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Function</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>Energy source to preserve lean body mass</td>
<td>30-55 kcal/kg BW &amp; adjust per client, level of obesity</td>
</tr>
<tr>
<td>Protein</td>
<td>Tissue maintenance Collagen synthesis, build LBM</td>
<td>1.25-1.5 g/kg BW adjust per condition, monitor renal status</td>
</tr>
<tr>
<td>Fluid</td>
<td>Normal cell function &amp; tissue integrity</td>
<td>1 mL/kcal consumed, monitor hydration status</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>Collagen synthesis, supports formation of new blood vessels</td>
<td>Mega doses not recommended</td>
</tr>
<tr>
<td>Zinc</td>
<td>Protein synthesis; cellular growth, deficiency impairs healing</td>
<td>RDA 11 mg/day males, 8 mg/day females, mega doses not recommended, UTL 40 mg/day</td>
</tr>
<tr>
<td>Arginine</td>
<td>Biological precursor to nitric oxide, increases blood flow which can support collagen in wounds</td>
<td>Supplemental arginine in T-cal protein supplement with micronutrients may be beneficial</td>
</tr>
</tbody>
</table>
Steps to Successful Nutrition Care

1. Screen and Assess Nutrition Status
   - Individualize interventions and develop POC

2. Provide diet based on estimated needs, consider fortified foods
   - Offer supplements between meals if intake is inadequate

3. Consider ONS fortified with arginine, vitamin or minerals if needs not met with high calorie/protein supplement
   - Consider EN/PN based on resident’s wishes, when needs cannot be met orally

Pressure Injury Care

Effective pressure injury treatment: multidisciplinary & holistic

Nursing Care
- Turning regimes, hygiene, etc.

Support Surfaces
- Mattresses, cushions, protection, etc.

Wound Care
- Dressings, cleaning, drainage, etc.

Nutrition
- Delivery of nutrients to stimulate healing

April 2015

The Role of Nutrition in Pressure Sore Management: National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, and Pan Pacific Pressure Injury Alliance White Paper

- Mary Ellen Posthauer, RDN, LD, CDA, FAND
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References

2. SKF: 18. Cereda E.
Nutrition Western malnutrition.
‐ European hydration.
T., M., et al. Based et.al.
for 14(8):542 adults:
and concentrated,
versus of plasma
of 1995.
Pressure DB, Posthauer ME.
E328. 2010; 26(9):8678 Nutrition
of 2007; 45(3):419 Pressure
D, et al. of 14(8):92
Acad Nutr Diet.
Malnutrition Healing Am
Acute ulcer 19(2):92
and 19(2):1395
A protein of
and 57(8):1395
Panel of the European Pressure
Panel of the European Pressure
Nutrition of the European Academy
of the European Pressure
Committee and Wound Healing Society [20].
and wound healing in elderly residents of a
and the wound healing process: an overview, effect, 9. 8-9-41.
3. van Heldt, M., et al. Systematic review on factors influencing the pressure ulcer
uptake and extent in elderly patients: a systematic review of the scientific literature. Ageing
4. van Heldt, M., et al. Systematic review on factors influencing the pressure ulcer
uptake and extent in elderly patients: a systematic review of the scientific literature. Ageing
5. van Heldt, M., et al. Systematic review on factors influencing the pressure ulcer
uptake and extent in elderly patients: a systematic review of the scientific literature. Ageing
Rese...