UPDATED BARIATRIC NUTRITION GUIDELINES

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THE OTTAWA HOSPITAL BARIATRIC CENTRE OF EXCELLENCE

CABPS ANNUAL CONFERENCE
NIAGARA FALLS, ON
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DISCLOSURES

§ No disclosures
OBJECTIVES

Overview of the 2016 ASMBS CPG – micronutrients

§ Identify micronutrients to screen for pre-and post-op.
§ Suggest supplementation for prevention of deficiencies.
§ Guidelines are currently in print….I am not able to defend EVIDENCE graded by the authors


*Co-Chair, Icahn School of Medicine at Mount Sinai, New York, New York
# GUIDELINES – ROUTINE SUPPLEMENTS

<table>
<thead>
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</thead>
<tbody>
<tr>
<td><strong>Vitamin B12</strong></td>
<td>2 MV (≥18 mg iron, folate, selenium, zinc)</td>
<td>1-2 MV (iron/folate)</td>
<td>2 MV (iron, folate, B1)</td>
<td>Not specified Vitamin/mineral supplements routine prescription</td>
</tr>
<tr>
<td><strong>Calcium</strong></td>
<td>350-500 mcg/d oral 1000 mcg/mo IM injections</td>
<td>Not specified</td>
<td>As needed to maintain B12 levels (1000 mcg/d oral)</td>
<td>Monitor</td>
</tr>
<tr>
<td><strong>Vitamin D</strong></td>
<td>1500-2000 mg Ca+ citrate</td>
<td>1200-2000 mg Ca+ carbonate or citrate</td>
<td>1200-1500 mg Ca+ citrate</td>
<td>Treat deficiencies</td>
</tr>
<tr>
<td><strong>Iron</strong></td>
<td>Min. 18-27 mg/d 50-100 mg/d (at risk)</td>
<td>Not specified (calcium supplements with vitamin D)</td>
<td>≥ 3000 IU/d</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>B-50 (&gt;1000 mg/d folate in supplements may mask B12 deficiency)</td>
<td>Screen for B1, vitamin K and vitamin A</td>
<td>45-60 mg (combined MV/additional iron)</td>
<td>2 mg/d Copper (as routine MV)</td>
</tr>
</tbody>
</table>
ASMBS 2016 NUTRITION GUIDELINES

Authors:
Julie Parrott
Dr. Laura Frank
Rebecca Dilks
Lillian Craggs-Dino
Kellene Isom
Laura Greiman
UPDATED NUTRITION GUIDELINES

Includes:

§ Pre-and post surgery nutrient screening recommendations
§ Supplementation recommendations for the prevention and treatment of micronutrient deficiencies

Systematic review process

AACE/TOS/ASMBS Protocol for Standardized Production of Clinical Practice Guidelines and the Institute of Medicine
EVIDENCE FORMULATION/GRADING

§ Grade A = Strong
§ Grade B = Intermediate
§ Grade C = Weak
§ Grade D = No evidence

§ BEL = best evidence level 1-4

402 publications meet search criteria

§ Meta-analyses (MRCT/NRCT)
§ RCT’s
§ Prospective case control trials
§ Prospective/retrospective cohort studies

§ Cross-sectional studies
§ Systematic reviews
§ CPG
§ Single case reports
RECOMMENDATIONS

§ 90 recommendations – micronutrients only
  § 79 new recommendations
  § 11 no changes since 2008

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K
- Thiamine
- Vitamin B12
- Folate
- Calcium
- Copper
- Zinc
- Iron
Between 30-80% of surgical candidates are in a state of “high calorie malnutrition” and show some dietary deficiency pre-operatively.


Optimizing POST-op outcomes and nutrition status begins PRE-operatively.
Routine pre-surgery screening is recommended in all patients

*(Grade A, BEL 1)*
VITAMIN D MALABSORPTION

PRE-OP

Higher risk groups:

- Elevated BMI/increased adiposity
- Nutrient interactions: oxalates and phytates
- Peri-and-post menopausal women
- Shift/night-shift workers
- Office workers
- Living in northern latitudes
- Darker skin pigmentation or skin veiling/covering
- GI disorders (Crohn’s, celiac, previous bowel resections)
- Kidney disease
EFFECT OF BODY WEIGHT ON THE RESPONSE OF SERUM 25(OH)D TO SUPPLEMENTATION

§ Lower response to supplementation in those with obesity

VITAMIN D DEFICIENCY

§ Vitamin D deficiency (<50 nmol/L; 20 ng/mL) = up to 86%
§ Vitamin D insufficiency (<75 nmol/L; 30 ng/mL) = up to 90%
§ Secondary Hyperparathyroidism (PTH >6.5 pmol/L) = 22-67%

Bioavailability of vitamin D is reduced because it is sequestered in adipose tissue

References:
de Luis, DA et al. SORD 2013;(9):323-328
10:1033-1037
Goldner, WS., et al Obes Surg (2008);18(2):
26:361-368
Ernst, B. el al. Obes Surg (2009);19:66-73
Toh, SY et al. Nutr (2009);25:1150-56
20:193-197
VITAMIN D STATUS AND ADVERSE OUTCOMES AFTER BARIATRIC SURGERY

§ Adverse outcomes associated with low vitamin D status (based on season).

§ Wound infection (p=0.018), dehiscence (p=0.001) and extended LOS (p<0.001). (NIS sample = 932,091)
VITAMIN D: PRE-OP

§ Analyzed effect of BMI on vitamin D levels in response to 300,000 IU of cholecalciferol prior to bariatric surgery

§ Retrospective study
§ 173 participants (67% female)
§ 25(OH)D, Ca^{2+}, PTH
§ Baseline, 6, 12, 26, 52 weeks following a 300,000 IU vitamin D load.

Clinical obesity
doi: 10.1111/obes.13176

High-dose oral colecalciferol loading in obesity: impact of body mass index and its utility prior to bariatric surgery to treat vitamin D deficiency

R. J. King^{1}, D. Chandra{2}{3}, A. Abbas{1}, S. M. Orme{1} and J. H. Berth{1,2}

VITAMIN D: PRE-OP

- Baseline: <30 nmol/L
- Higher PTH levels with increasing BMI
- $25(OH)D$ ↓ by 6 mo (59.2±21 nmol/L, $p=0.005$)
- By 1 yr post-op: all groups <75 nmol/L

VITAMIN D: PRE-OP

Only 6% of “normal” BMI category had vitamin D levels <50 nmol/L

As vitamin D levels declined after loading PTH levels begun to rise in obesity categories ($p = 0.04$)

VITAMIN D RECOMMENDATIONS

§ Measure 25(OH)D, serum ALP, PTH and 24-hour urinary calcium

§ Optimize 25(OH)D levels prior to surgery (>75 nmol/L; 30ng/mL)

Vitamin D3 dose of 3000 IU/day (Grade D, BEL 4)

50,000 IU Vitamin D2 1-3x weekly (Grade A, BEL 1)

Vitamin D3 is recommended as a more potent treatment than vitamin D2; both forms can be effective (pending the dose regimen) (Grade A, BEL 1)
### Table 1: Pre-WLS Nutrient Screening Recommendations

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Pre-WLS Nutrient Screening Recommendation</th>
<th>Rationale</th>
<th>Other Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thiamin</td>
<td>• Routine pre-WLS screening* is recommended in all patients. (Grade C, BIL 3) [1]</td>
<td>• Prevalence of thiamin deficiency (TD) pre-WLS is reported to be as high as 29%</td>
<td>• Thiamin diphosphate (TDP), the biologically active form of thiamin, is not found in measurable concentrations in plasma, and is best determined in whole blood specimens. Plasma thiamin concentration reflects recent intake rather than body stores. Thiamin carried by albumin will be decreased with concomitant hypoalbuminemia.</td>
</tr>
<tr>
<td>Fat soluble vitamins (A, E, K)</td>
<td>• Routine pre-WLS screening is recommended in all patients. (Grade C, BIL 3) [1]</td>
<td>• Prevalence of deficiencies pre-WLS is reported to be:</td>
<td>• Use physical signs and symptoms and labs (Table 3) for:</td>
</tr>
<tr>
<td>Vitamin B12 (Cobalamin)</td>
<td>• Routine pre-WLS screening of B12 is recommended for all patients. (Grade B, BIL 2) [1]</td>
<td>• Prevalence of B12 deficiency is reported to be between 2-18% in patients with obesity and 6-30% in patients</td>
<td>• Vitamin A 14%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Serum B12 levels alone may not be adequate to identify B12 deficiency.</td>
<td>• Vitamin E 2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Elevated MMA levels (values &gt;40 pmol/L) are reported to be between 24-28% in WLS samples overall, and 74% of patients seeking BPD/DS.</td>
<td>• Vitamin K deficiency: DCP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Zinc assays in pre-WLS patients should be interpreted in light of the fact that patients with obesity have lower serum zinc levels and lower concentrations of zinc in plasma and erythrocytes than leaner patients. Thus, repletion of zinc is indicated when signs and symptoms are present.</td>
<td>• Use physical signs and symptoms and labs (Table 3):</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Serum or urinary zinc or RBC zinc</td>
</tr>
</tbody>
</table>
POST-OPERATIVE: Vitamin & mineral supplement recommendations for prevention
### Preventative Supplementation

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Vitamin B1</th>
<th>Vitamin B12</th>
<th>Folate</th>
<th>Vitamin A</th>
<th>Vitamin E</th>
<th>Vitamin K</th>
<th>Vitamin D</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>≥12mg</td>
<td>Oral: 350-500 mcg</td>
<td>400-800 mcg</td>
<td>5000 IU</td>
<td>15 mg</td>
<td>90-120 mg</td>
<td>3000 IU (titrated to meet &gt;75 nmol/L)</td>
</tr>
<tr>
<td>RYGB</td>
<td></td>
<td>1000mcg/mo IM</td>
<td>800-1000 mcg (F)</td>
<td>5000-10,000 IU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BPD/DS</td>
<td></td>
<td></td>
<td>10,000 IU</td>
<td></td>
<td></td>
<td>300 mg</td>
<td></td>
</tr>
</tbody>
</table>
## Preventative Supplementation

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Calcium</th>
<th>Iron</th>
<th>Zinc</th>
<th>Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>1200-1500 mg</td>
<td>18 mg</td>
<td>8-11 mg</td>
<td>1 mg</td>
</tr>
<tr>
<td>RYGB</td>
<td>1800-2400 mg</td>
<td>45-60 mg</td>
<td>8-22 mg</td>
<td>1-2 mg</td>
</tr>
<tr>
<td>BPD/DS</td>
<td>1800-2400 mg</td>
<td>16-22 mg</td>
<td>2 mg</td>
<td></td>
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</tbody>
</table>
What to look for in a multivitamin

- 5000-10,000 IU vitamin A
- 400-1000 mcg folate
- 8-22 mg zinc
- 1-2 mg copper
- Equal vitamins to mineral list
- Add B50 complex
**Example (SG/RYGB)**

**Breakfast**
- Adult multivitamin (1-2)
- Vitamin B12 500 mcg
- Vitamin D 1000 IU (1-3 pills)
- Calcium citrate 300-600 mg (1-2 pills)

**Lunch**

**Supper**
- Calcium citrate 300-600 mg (1-2 pills)

**Bedtime**
- Iron 45-60 mg (elemental)
CATHY – POST-OP

§ 46 yo female
§ PMHx: RYGB (2013), OA, depression,
§ Post-op Hx: anastomotic leak (admitted x 3.5 weeks);
   intra-abdominal abscesses; marginal
   ulcers; IDA–IV iron; food intolerances
§ WtHx: Pre-op: 343 lbs (156 kg)
   4 yr wt: 205 lbs (93 kg) [x] 135lbs wt loss (39%
   TWL)
Nutrition assessment:
§ Low appetite: <1000 kcal/day
§ Food intolerances (beef, chicken, bread, rice)
§ Hx of GI symptoms (nausea and constipation)
§ Difficulty taking supplements regularly:
  § D/C MVI ~ 6 mo ago (on/off for years)
  § No calcium x 1 year
  § Vitamin D 1000 IU 3/7
  § B12 injections (monthly)
  § On/off ferrous sulfate 300 mg (hx of IV iron)

Other findings:
§ Difficulties walking, trips often
§ Tingling in extremities (hands/feet)
§ Memory loss, concentration difficulties, forgetting words
THIAMINE CHANGES IN GUIDELINES

§ Thiamine supplementation above the RDA (1.1-1.2mg) is suggested to prevent deficiency

...at least 12 mg thiamine daily to maintain blood thiamine levels after surgery (Grade C, BEL 3)...

...or supplement with B50 complex (50mg dose thiamine) 1-2x/day (Grade D, BEL 4)
SCREENING FOR THIAMINE DEFICIENCY

Early s/s: Dry beriberi
Peripheral neuropathy, muscle weakness, pain in upper/lower extremities, gait ataxia.

Early s/s: Wet beriberi
Heart failure with high cardiac output, edema in lower extremities, tachycardia

Advanced s/s: Wernicke’s encephalopathy
Polyneuropathy and ataxia, ocular changes (nystagmus), confusion, memory loss

Other:
Slow gastric emptying, nausea, vomiting, constipation
THIAMINE RISKS POST-OP

§ Routine post-op screening for high-risk groups (Grade B, BEL 2)

…at least 12 mg thiamine daily to maintain blood thiamine levels after surgery (Grade C, BEL 3)…

…or supplement with B50 complex (50mg dose thiamine) 1-2x/day (Grade D, BEL 4)

Other:
Slow gastric emptying, nausea, vomiting, constipation
CATHY

Nutrition assessment:

- Low appetite: <1000 kcal/day
- Food intolerances (beef, chicken, bread, rice)
- GI symptoms (nausea and constipation)
- Difficulty taking supplements regularly:
  - D/C MVI ~ 6 mo ago (on/off for years)
  - No calcium x 1 year
  - Vitamin D 1000 IU 3/7
  - B12 injections (monthly)
  - On/off ferrous sulfate 300 mg (hx of IV iron)

Other findings:

- Difficulties walking, trips often
- Tingling in extremities (hands/feet)
- Memory loss, concentration difficulties, forgetting words
SCREENING FOR THIAMINE DEFICIENCY

Pt reports limited food intake, not adhering to multivitamins, supplements lacking B1, poor dietitian/clinic follow-up, GI symptoms (persistent nausea, vomiting, constipation), rapid weight loss, parenteral nutrition, excessive alcohol intake

Blood tests – serum thiamine may NOT detect B1 deficiency

If you suspect….treat.
Don’t wait for laboratory confirmation
RX THIAMINE DEFICIENCY

Oral therapy:

§ 100 mg thiamine 2-3 x/day until symptoms resolve (3-6 months) (Grade D, BEL 4)

IV therapy:

§ 200 mg 3x/day to 500 mg 1-2x/day for 3-5 days then 250 mg/day x 3-5 days (or until s/s resolved) + 100 mg/day po indefinitely (Grade D, BEL 4)

IM therapy:

§ 250 mg daily x 3-5 days OR 100-250 mg monthly (Grade C, BEL 3)

CAUTION:

§ Do not use glucose with IV thiamine
§ Consider antibiotics in recurrent cases (risk of small intestine bacterial overgrowth)
Thiamine in multivitamins

Choose a MV containing at least 12 mg thiamine

Or add a B50 Complex to daily MV

Use a nutrition focused physical assessment to evaluate signs/symptoms
Nutrition Assessment Findings:
1) Poly-micronutrient deficiencies
   § Suspected thiamine deficiency
   § IDA, vitamin B12
2) Malnutrition

Nutrition Intervention:
1) In collaboration with physician or NP:
   § Thiamine (vitamin B1) 100 mg TID
   § Restart/change multivitamin
   § Re-initiate IV iron infusions
   § Address calcium/vitamin D in f/u
2) Consider oral supplementation
# TREATMENT OF VITAMIN DEFICIENCIES

<table>
<thead>
<tr>
<th>Vitamin B1</th>
<th>Vitamin B12</th>
<th>Folate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral: 100 mg 2-3x/d</td>
<td></td>
<td>1000 mcg* (potential to mask B12 def)</td>
</tr>
<tr>
<td>IV: 200 mg TID – 500 mg BID x 3-5 d</td>
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<tr>
<td>IM: 250 mg/d x 3-5 d or 100-250 mg mo</td>
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<tr>
<td>Vitamin A</td>
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<tr>
<td>w/o corneal changes: 10,000-25,000 IU/d until clinical improvement</td>
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<tr>
<td>With corneal changes: 50,000 IU IM x 3 days + 50,000 IU/d IM x 2 weeks</td>
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<tr>
<td>Evaluate concurrent iron and copper deficiencies</td>
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<tr>
<td>Vitamin E</td>
<td></td>
<td></td>
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<tr>
<td>100-400 IU/d</td>
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<tr>
<td>Vitamin K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-2 mg orally or 1-2 mg / week PN</td>
<td></td>
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<tr>
<td>Vitamin D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000-6000 IU/d or 50,000 IU vitamin D2 1-3x/week</td>
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</table>
# TREATMENT OF MINERAL DEFICIENCIES

<table>
<thead>
<tr>
<th>Mineral</th>
<th>SG/RYGB: 1200-1500 mg/d</th>
<th>BPD/DS: 1800-2400 mg/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td><em>from all supplemental sources</em></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Iron</th>
<th>Zinc</th>
<th>Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>150-300 mg</td>
<td>2-3x/day</td>
<td>Mild-mod: 3-8 mg/d oral (copper gluconate or sulfate)</td>
</tr>
<tr>
<td>IV iron if oral therapy ineffective</td>
<td></td>
<td>Severe: 2-4 mg IV x 6 days (until /s resolve)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitor q 3 mo</td>
</tr>
</tbody>
</table>

*NO TIME TODAY*
NUTRITION FOCUSED PHYSICAL ASSESSMENT

- General inspection
- Head/hair
- Eyes/mouth
- Neck/chest
- Skins/nails
- Muscle loss
- Subcutaneous fat loss
BARIATRIC NUTRITION ASSESSMENT BEFORE & AFTER SURGERY

Evaluation completed by a registered dietitian (part of the interdisciplinary team):

- Identify nutrition status and risks
- Trained to identify micronutrient deficiencies via Nutrition Focused Physical Assessment (NFPA)
- Optimize micronutrient deficiencies
- Make recommendations – dietary and supplemental sources

Mechanick, J.I., et al. SORD. 2013; 159-191
NUTRITION-RELATED CONDITIONS AFFECTING NUTRITION-STATUS

§ IBS/IBD/Crohn’s/Colitis/Celiac disease
§ Chronic kidney disease, NAFLD
§ Hx of eating disorders
§ Vegetarian/Vegan
§ CAD/COPD
§ Diabetes
§ MS
UPDATED NUTRITION GUIDELINES

Future:

§ Full guidelines published in Surg Obes Relat Dis (SORD) journal
§ Available on www.asmbs.org
§ Update guidelines macronutrient and post-op diet progression
Thank you

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REFERENCES

Ernst, B. et al. Evidence for the necessity to systematically assess micronutrient status prior to bariatric surgery. *Obes Surg* (2009);19:66-73

Toh, SY et al. Nutr (2009);25:1150-56


Moizé, V. et al. Nutritional intake and prevalence of nutritional deficiencies prior to surgery in a Spanish morbidly obese population. *Obes Surg* (2011);21(9):1382-88

Bauman, WA et al. Diabetes Care. 2000;23(9):1227-1231
