IFSO

XXIX IFSO World Congress

1-4 September 2026 | Toronto, Canada

HOW & WHO ASSESSES MICRONUTRIENT STATUS

Karen Flanders, CNP
Mass General Hospital
Boston, MA, USA

TORONTO2026

The Future of Obesity Management:
From Weight Loss to Health Gain

ifso2026.org

Disclosure Slide

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

	No, nothing to disclose
√	Yes, please specify

Company Name	Honoraria, Expenses	Consulting, Advisory Board	Funded Research	Royalities, Patent	Stock Options	Ownership, Equity Position	Employee	Other (please specify)
Novo Nordisk		Consulting						Focus Group
American Journal of Managed Care		Consulting						Focus Group

Case study: MW

17 yo female

Ht: 64 inches (162.6 cm)

Wt: 284 lbs (128.8 kg)

BMI: 49.75 kg/m^2

"I want to have surgery for my health"

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

PAST MEDICAL HISTORY

- OBSTRUCTIVE SLEEP APNEA
- SEIZURE

PAST SURGICAL HISTORY

NONE

SOCIAL HISTORY

- SINGLE, STUDENT
- NO CHILDREN
- DENIES ETOH, NICOTINE, ILLICIT/RECREATIONAL DRUG USE

Medication(s)

- Fluticasone propionate
- Levetiracetam
- Loratadine
- Methylphenidate
- MVI with iron

Side Note: Mom s/p LRYGB

TORONTO2026 From Weight Loss to Health Gain

- **Adolescent Weight Loss Surgery Program**
  - **Group sessions preoperatively**
  - **Group sessions postoperatively**
  - **Individual vists**

Laparoscopic roux en-y gastric bypass, 2019

- **Surgical Procedure:** Uneventful
  Postoperative Course: Uneventful, UGI = no evidence of leak or obstruction; able to tolerate liquids without nausea/vomiting, otherwise stable; discharge to home POD #1

Patient maintained follow-up X15 months with surgeon/pediatric obesity medicine provider;
RD visit @ 2 years postop;

LOST to follow-up

Several ED visits related to seizure activity;
Lost to follow-up with the Weight Center despite efforts to schedule follow-up, UNTIL…

Fast forward to February, 2023
Emergency department visit

S/S started in December with BLE weakness

- Progressively worsening bilateral lower extremity weakness
- Paresthesias – have progressively gotten worse & worked its way up her legs (ankles to thighs)
- Intermittent diplopia x2 months; none at time of ED visit
- Patient reports she was evaluated by her local neurologist with no further evaluation or diagnostic testing
- Patient transitioned her care to another neurologist who raised mild concern for GBS as he had noted absent reflexes on exam however he had more suspicion that her symptoms were functional → Sent to the ED

Other pertinent information…

Patient also reports episode of bowel incontinence, but noted that she was lactose intolerant and had a lot of dairy prior to ED visit

- Denied…
  - Bowel retention, urinary retention or urinary incontinence
  - Saddle anesthesia.
  - Any current diplopia.
  - Flashing lights, blurry vision.
  - Any of her symptoms feeling like past seizures, compliant with Keppra.
  - Recent fevers, chills, chest pain, shortness of breath, abdominal pain, nausea or vomiting, back pain, lower extremity swelling or pain, falls or trauma, confusion, headache, room spinning dizziness, blood in stool, dysuria, urgency, frequency.

BLOOD WORK RESULTS

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

Sodium	141
Potassium	**3.3 (L)**
Chloride	104
Carbon Dioxide	27
BUN	9
Creatinine	**0.49 (L)**
Glucose	87
Anion Gap	10
Lactic acid	**2.9 (H)**
Total Protein	**5.1 (L)**
Albumin	**2.7 (L)**

Folate	**4.3 (L)**
Vitamin B12	836
TSH	2.04
Hgb A1C	**<4.2 (L)**
25 (OH) Vitamin D	**8 (L)**
Calcium	**8.2 (L)**
Vitamin B1	**43 (L)**
Vitamin B3	25.4
Vitamin B6	**<2 (L)**
Vitamin E (Alpha)	7.2
Copper	**30 (L)**
Zinc	**40 (L)**
Selenium	**89 (L)**

WBC	**3.29 (L)**
RBC	**3.74 (L)**
Hgb	**10.6 (L)**
HCT	**33.8 (L)**
MCV	90.4
MCH	28.3
MCHC	**31.4 (L)**
PLT	255
MPV	10.7
RDW	**19.3 (H)**

Common Signs & Symptoms of Micronutrient Deficiencies After MBS

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

Nutrient deficiency	Common signs & symptoms	Clinical clues / nursing assessment
Iron	Fatigue, weakness, pallor, shortness of breath, dizziness, headache, brittle nails, hair loss, restless legs, pica	Assess CBC, ferritin and iron studies; consider menstrual/GI blood loss
Vitamin B12	Fatigue, megaloblastic anemia, numbness/tingling, peripheral neuropathy, impaired balance/gait, cognitive changes, glossitis	Neurologic symptoms can occur without anemia; assess B12 and, when indicated, MMA
Folate (B9)	Fatigue, weakness, pallor, megaloblastic anemia, glossitis, oral ulcers	CBC/MCV and folate; neurologic manifestations are not typical

Nutrient deficiency	Common signs & symptoms	Clinical clues / nursing assessment
Thiamine (B1)	Fatigue, weakness, anorexia, nausea/vomiting, peripheral neuropathy, confusion, ataxia	Particularly important with prolonged vomiting, poor intake or rapid weight loss
Vitamin D	Bone pain, muscle weakness, muscle aches/cramps, increased risk of osteomalacia and fractures	Assess 25-OH vitamin D, calcium, PTH and bone health as appropriate
Calcium	Paresthesias, muscle cramps, tetany, weakness; severe deficiency may cause seizures or cardiac rhythm abnormalities; long-term deficiency → osteoporosis/fractures	Consider calcium, vitamin D, PTH and albumin/ionized calcium; symptoms may reflect hypocalcemia

Nutrient deficiency	Common signs & symptoms	Clinical clues / nursing assessment
Vitamin A	Night blindness, impaired dark adaptation, dry eyes, xerosis, increased susceptibility to infection	Ask about difficulty seeing in dim light; assess ocular/skin findings
Zinc	Hair loss, dermatitis/rash, poor wound healing, impaired taste/smell, decreased appetite, diarrhea	Assess skin, hair, taste changes and wound healing; excess zinc may contribute to copper deficiency
Copper	Anemia, neutropenia, fatigue, weakness, numbness/tingling, gait disturbance, difficulty walking	Neurologic findings can mimic B12 deficiency; assess CBC, copper and ceruloplasmin
Selenium	Muscle weakness, fatigue, myopathy, cardiomyopathy, impaired immune function, hair/nail changes	Consider selenium deficiency with significant malabsorption or prolonged inadequate intake

* Please be aware – Deficiency symptoms may overlap

- **Neuropathy:** B12, copper, thiamine
- **Anemia/fatigue:** iron, B12, folate, copper
- **Hair loss:** zinc, iron, sometimes selenium
- **Bone/muscle symptoms:** vitamin D, calcium
- **Vomiting/poor intake:** an important **risk factor for thiamine deficiency**, rather than simply a symptom

Admitted to the hospital:

- Treated empirically for Wernicke's encephalopathy: 3 days of IV thiamine 500 mg q8hrs
  - Transitioned to oral supplement
- Repleted folate, vitamin b6, copper
- D/c to home (6 days post admission) on bariatric MVI, calcium citrate + vitamin d, cholecalciferol 50,000 units weekly, b complex vitamin

Follow-up

Patient was seen in the outpatient MBS clinic by APP, RD, behavioral health

- Admits to EtOH, but did not endorse symptoms of AUD (per psychologist eval)
- Admits to MJ 2X/month
- Vapes nicotine “all day”
- Close monitoring of labs

Readmission to hospital X3

- Nutritional deficiencies
- Diarrhea, hair loss and weakness
- Worsening symptoms: visual disturbances, balance has worsened and she cannot walk independently, little control of bowels and bladder to the point of now wearing a diaper, and constantly dizzy

BLOOD WORK RESULTS

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

Sodium	139
Potassium	4.7
Chloride	100
Carbon Dioxide	27
BUN	20
Creatinine	0.50 (L)
Glucose	83
Anion Gap	12
25 (OH)Vitamin D Total	35
Albumin	4.5
Bilirubin (Total)	0.3
Total Protein	7.1
AST (SGOT)	22
ALT (SGPT)	21
Alk Phos	94
Globulin	2.6

Calcium	9.7
Magnesium	2.0
Phosphorus	4.3
Folate	18.7
Iron	166 (H)
Iron Saturation	35
TIBC	472 (H)
Vitamin B12	>2000
TSH	1.30
Hgb A1C	4.6
Mean Bld Glucose, calc'd	85
PTH, Intact (pg/mL	68 (H)
Copper	136
Selenium	
Vitamin A Retinol	50
Vitamin B1 (nmol/L)Thiamine	44 (H)

WBC	5.06
RBC	4.55
Hgb	10.3 (L)
HCT	35.3 (L)
MCV	77.6 (L)
MCH	22.6 (L)
MCHC	29.2 (L)
PLT	385
MPV	11.9
RDW	18.2 (H)
Zinc	82

Where is MW now?

- Last visit: 12/2024
- Multiple attempts to contact patient via phone, patient gateway messages
- Lost to follow-up

HOW & WHO ASSESSES MICRONUTRIENT STATUS

HOW TO ASSESS FOR MICRONUTRIENT DEFICIENCIES

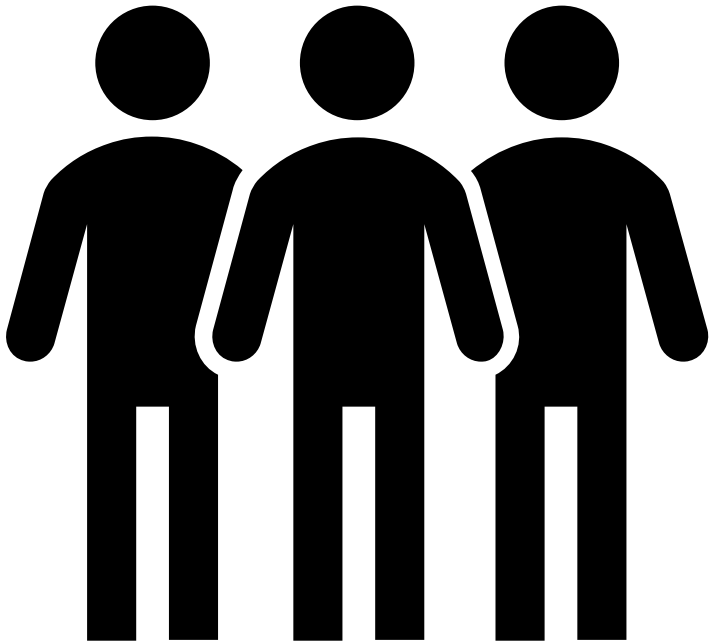
IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

Constant open communication with patient and significant others;
Frequent follow-up with the multidisciplinary team;
Monitor blood work;
Assess for signs/symptoms of deficiencies
Physical Exam/Nutrition Focused Exam
Dietary History
Other

WHO ASSESSES FOR MICRONUTRIENT DEFICIENCIES

IFSO
XXIX IFSO World Congress
1-4 September 2026
Toronto, Canada

It takes a village



- Patient
- Significant other
- Surgeon/APP
- Registered Nurse
- Dietitian: In-patient and Out-patient
- Psychologist – Behavioral Health Provider
- Primary Care Provider
- Other Health Care Providers

To Summarize:

Obesity is a disease and needs life-long management;

Metabolic and bariatric surgery needs long-term follow-up and life-long management, long-term vitamin/mineral supplementation after surgery and long-term surveillance of vitamin and mineral levels

Vitamin deficiencies can and do occur at any time in the process –

- preoperatively
- perioperatively
- immediate postoperatively
- long-term postoperatively

Multidisciplinary team is crucial to providing comprehensive assessment and care

REFERENCE LIST

- **Parrott J, Frank L, Rabena R, Craggs-Dino L, Isom KA, Ernst B.** American Society for Metabolic and Bariatric Surgery Integrated Health Nutritional Guidelines for the Surgical Weight Loss Patient—2016 Update: Micronutrients. *Surgery for Obesity and Related Diseases*. 2017;13(5):727-741.
  This should be your primary reference for the MBS micronutrient content. It specifically covers thiamine (B1), B12, folate, iron, vitamins A and D, calcium, copper, and zinc. ASMBS Nutritional Guidelines—2016 Update
- **O'Kane M, Parretti HM, Hughes CA, et al.** British Obesity and Metabolic Surgery Society Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery—2020 update. *Obesity Reviews*. 2020;21(11):e13087.
  This is particularly useful for your **clinical signs/symptoms table**. It discusses anemia, neurologic manifestations, night blindness, hair loss, poor wound healing, vitamin D/calcium monitoring, and selenium-related cardiomyopathy and myopathy. BOMSS 2020 Guidelines
- **Mechanick JI, Apovian C, Brethauer S, et al.** Clinical Practice Guidelines for the Perioperative Nutrition, Metabolic, and Nonsurgical Support of Patients Undergoing Bariatric Procedures—2019 Update. *Endocrine Practice*. 2019;25(12):1346-1359.
  Useful as a broader guideline reference for perioperative and postoperative nutritional management.
- **National Institutes of Health, Office of Dietary Supplements (ODS).** Fact Sheets for Health Professionals: Vitamin A, Thiamin, Vitamin B12, Folate, Iron, Vitamin D, Calcium, Zinc, Copper, and Selenium.