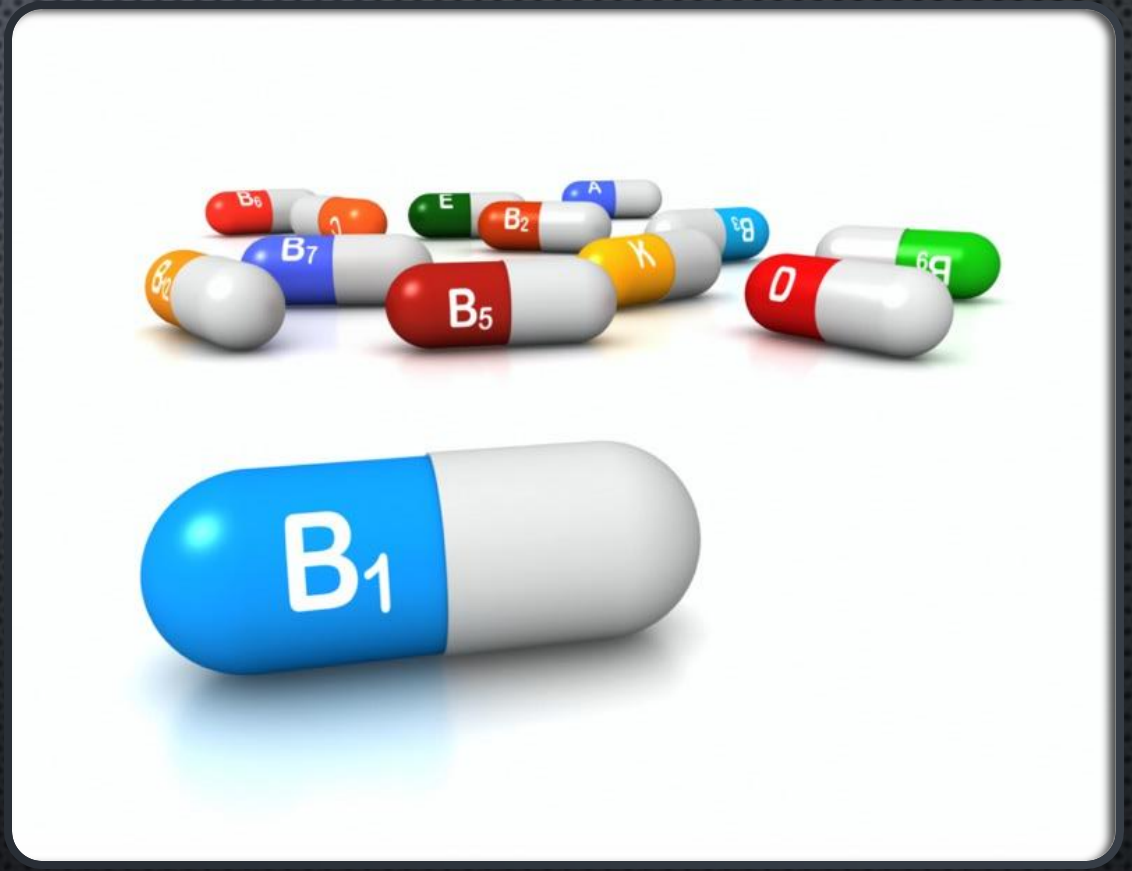
OMM & MBS BEYOND THE LAB:

RAPID RECOGNITION & TREATMENT OF THIAMINE DEFICIENCY



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IFSO TORONTO 2026

DISCLOSURES

- MEDTRONIC CONSULTANT
- ENDOLUMIK CONSULTANT

LEARNING OBJECTIVES

1. Understand that OMM & MBS patients are at high risk of thiamine deficiency due to reduced nutritional intake
2. List the Caine criteria for clinical diagnosis of Wernicke's
3. Describe the prevention and treatment of Wernicke's encephalopathy
4. Be familiar with the 2025 ASMBS Wernicke's Guidelines

THIAMINE FUNCTIONS

ENERGY PRODUCTION

CELL GROWTH & FUNCTION

MYELIN SHEATH MAINTENANCE

Thiamine (Vitamin B1)

Non-Bariatric Daily requirement: 1.1-1.2 mg

Human body stores: 30-50 mg

Short half-life: 9-18 days

Depleted: 2-3 weeks

Wernicke's Encephalopathy Pathophysiology

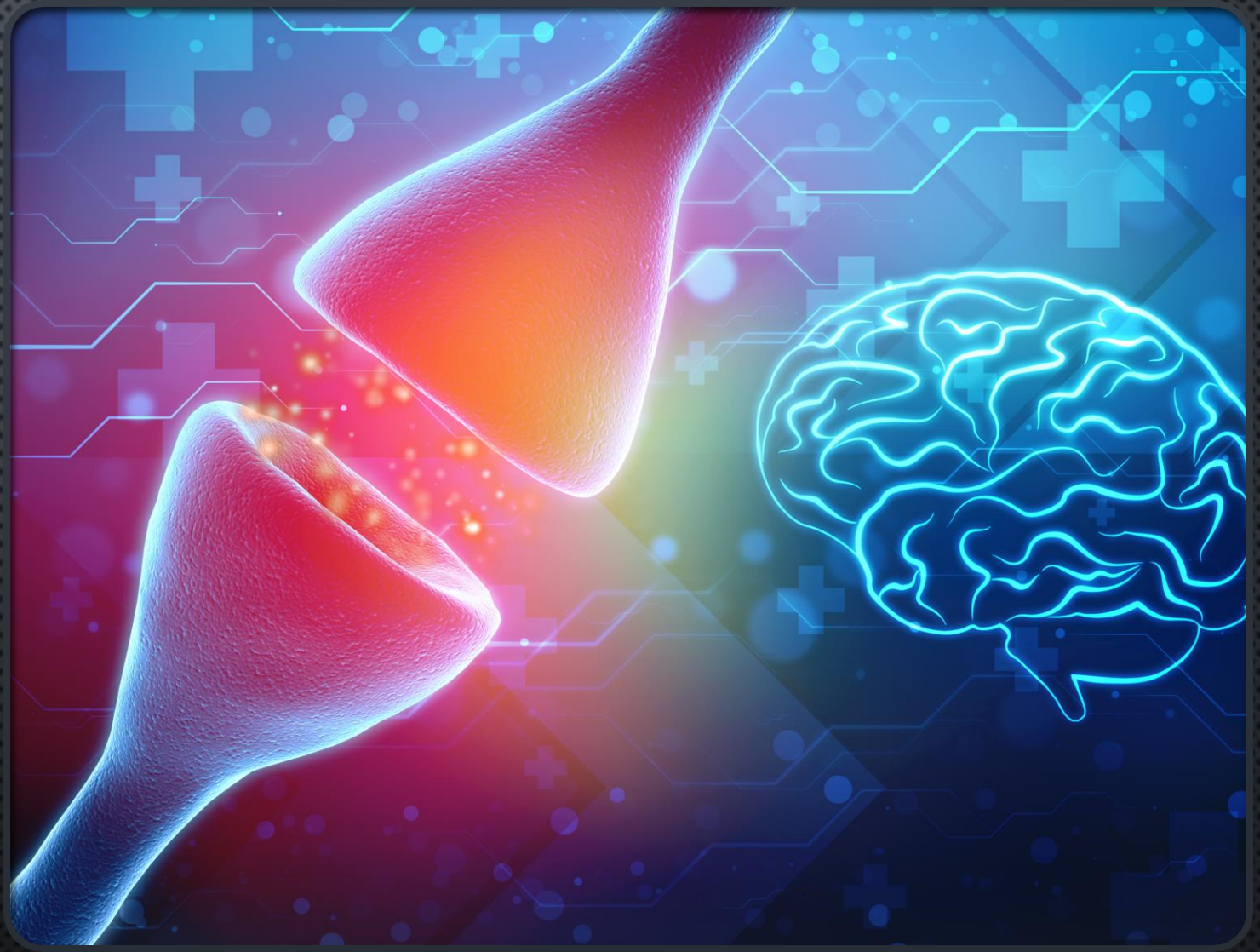
- Thiamine is a co-factor in the Krebs cycle; disruption reduces ATP production
- Results in shunting to glutamate production, free radical production and neuroexcitotoxicity
- These mechanisms result in cell death
- Impairs myelin sheath maintenance

Clinical Presentation of Thiamine Deficiency

- Fatigue
- Generalized weakness
- Irritability
- Poor appetite
- Nausea
- Vomiting

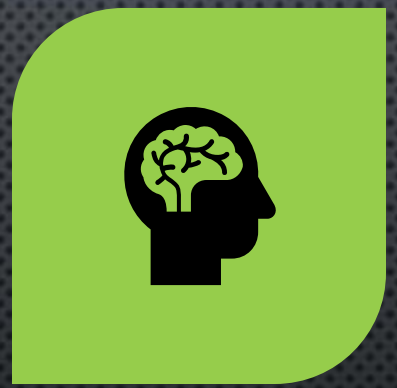
WERNICKE'S ENCEPHALOPATHY

- Acute neuropsychiatric syndrome
- Ataxia, vision issues & confusion
- Emergency treatment with high-dose **thiamine 500 mg IV tid for at least 5 days & continue until no further improvement**
- Inadequate or delayed treatment can lead to Wernicke-Korsakoff syndrome



CLASSIC TRIAD OF WERNICKES ENCEPHALOPATHY

EYE SIGNS



CONFUSION

ATAXIA

Caine Criteria for Wernicke's Encephalopathy

- Caine et al developed a proposed set of criteria
  - High sensitivity and specificity
- Diagnosis of Wernicke's requires 2 of:
  - Dietary deficiency
  - Eye signs
  - Cerebellar signs
  - Mild memory impairment or altered mental state

ASMBS
WERNICKE'S TASK FORCE MISSION STATEMENT

OUR MISSION IS TO EDUCATE ASMBS MEMBERS, OTHER CLINICIANS, AND THE PUBLIC ABOUT THIAMINE DEFICIENCY AND WERNICKE'S ENCEPHALOPATHY.

ULTIMATELY, OUR GOAL IS TO HELP PREVENT WERNICKE'S ENCEPHALOPATHY AND WERNICKE-KORSAKOFF SYNDROME.

ELSEVIER

Surgery for Obesity and Related Diseases ■ (2025) 1–12

SURGERY FOR OBESITY AND RELATED DISEASES

ASMBS Guidelines

ASMBS literature review & clinical guidelines on prevention, diagnosis, and treatment of Wernicke's encephalopathy and Wernicke-Korsakoff syndrome

Emma Patterson, MD[a,*], Marina Kurian, MD[b], Nate Sann, MSN[c], Adrian Dan, MD[a], Christine Lovato, MD[d], Marcelo Hinojosa, MD[e], Sanjeev Sockalingam, MD[f], Lillian Craggs-Dino, RDN, LDN[g], Kamran Samakar, MD[h], Kati Duncan, PsyD[i], ASMBS Wernicke's Task Force

THIAMINE DEFICIENCY IS COMMON IN OBESITY, BEFORE OMM OR MBS

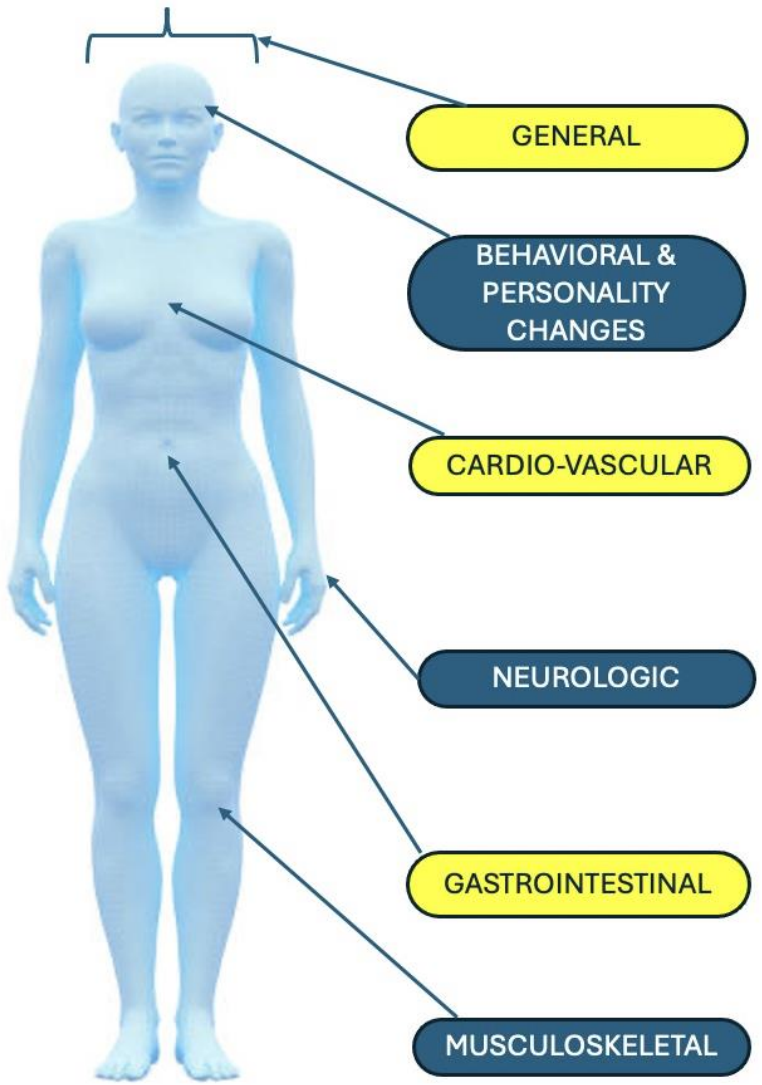
- COMPLICATION OF BARIATRIC SURGERY THAT IS UNDERDIAGNOSED
- CAN BE SEEN AFTER ANY MBS
- THIAMINE ABSORPTION IS PRIMARILY IN DUODENUM & PROXIMAL JEJUNUM, SO RYGB & BPD HIGHER RISK THAN GASTRIC BAND OR SLEEVE GASTRECTOMY
- 2016 ASMBS GUIDELINES: SCREEN AS 15-29% DEFICIENCY PREOPERATIVELY

Kerns et al, Advances in Nutrition, 2015

LOW FREQUENCY AND HIGH SEVERITY

- **FOCUS ON PREVENTION (SIMILAR TO VTE)**
- NEED ROUTINE ORAL THIAMINE PROPHYLAXIS
- THIAMINE DEFICIENCY CAN LEAD TO IRREVERSIBLE BRAIN DAMAGE

- **TREATMENT IS AN EMERGENCY (SIMILAR TO VTE)**
- TIME IS OF THE ESSENCE
- NEEDS **HIGH-DOSE** INTRAVENOUS THIAMINE TREATMENT



SIGNS	SYMPTOMS
Cold Excess weight loss	Hypothermia
Confabulation Hallucinations Apathy Executive dysfunction Mood instability Lack of Focus	Fatigue Lethargy Anger / Agitation Depression Psychosis
Hypotension Tachycardia Cardiomegaly Syncope	Edema Dyspnea
Memory issues Word finding Confusion Nystagmus Papilledema Oculomotor dysfunction	Diplopia Ptosis Decreased visual acuity Hearing loss Seizures Coma Paresthesia Numbness Tingling
Poor oral intake Constipation	Nausea Vomiting Anorexia Early satiety Abdominal pain
Ataxia Shuffling/wide gait Immobility Temporal wasting Trips / Falls	Muscle cramps Weakness / flaccidity Unsteady Paralysis

SYMPTOMS & SIGNS OF THIAMINE DEFICIENCY, WERNICKE'S AND WKS

TREATMENT OF WERNICKE'S IS AN EMERGENCY!

- PROMPT CLINICAL RECOGNITION AND TREATMENT
- IF NOT PROMPTLY AND ADEQUATELY TREATED, PERMANENT STRUCTURAL CHANGES OF THE BRAIN MAY RESULT
- PROLONGED TURNAROUND TIME OF THIAMINE ASSAY – TREAT EMPIRICALLY WITHOUT DELAY

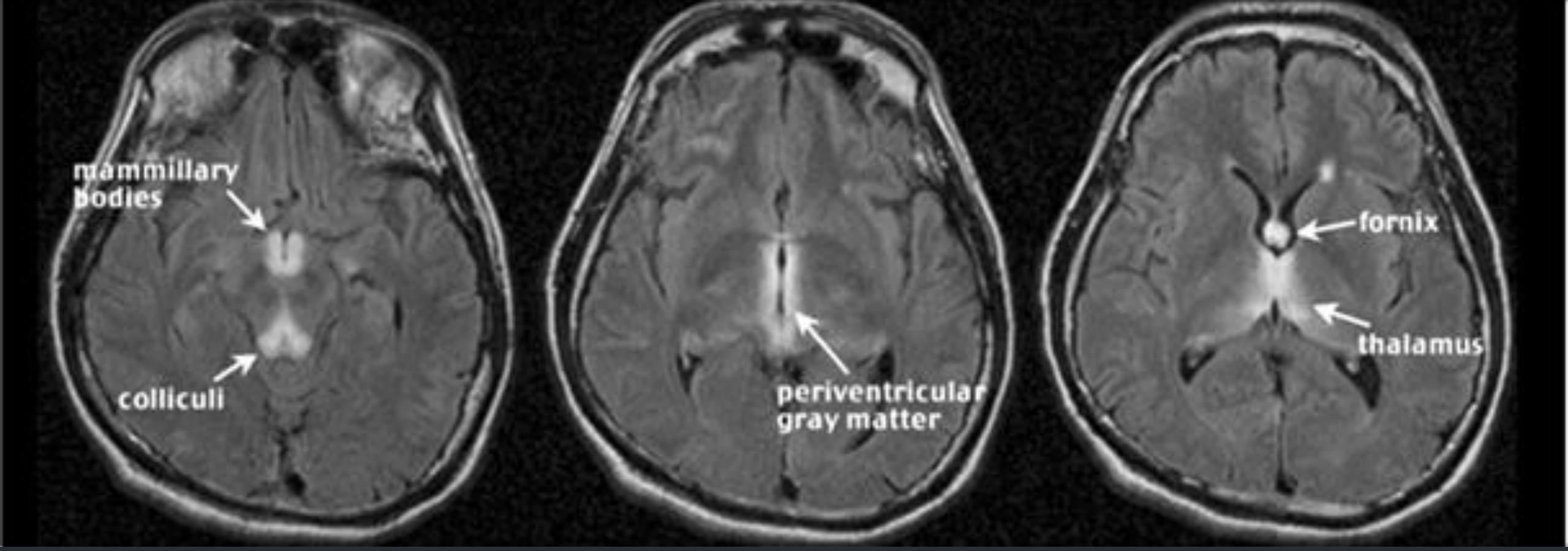
DIAGNOSTIC TESTS ARE CONFIRMATORY

BIOCHEMISTRY

- WHOLE BLOOD THIAMINE
- DRAW LEVEL, TREAT EMPIRICALLY

IMAGING:

- MRI BRAIN
  - LOW SENSITIVITY (50%)
  - HIGH SPECIFICITY (93%)



T2-WEIGHTED MRI IN WERNICKE'S

THE MOST DISTINCTIVE NEUROIMAGING FINDINGS OF ACUTE WE ARE CYTOTOXIC EDEMA AND VASOGENIC EDEMA

REPRESENTED BY BILATERAL SYMMETRIC HYPERINTENSITY ALTERATIONS ON T2-WEIGHTED MR IMAGES IN THE PERIPHERY OF THE THIRD VENTRICLE, PERIAQUEDUCTAL AREA, MAMMILLARY BODIES AND MIDBRAIN TECTAL PLATE

Jung et al, Neuropsychol Rev, 2012

SYSTEMATIC REVIEW OF WERNICKE'S AFTER BARIATRIC SURGERY 2008

- 104 REPORTED CASES, INCLUDED 84 WHO HAD SUFFICIENT DATA AVAILABLE
- GASTRIC BYPASS OR RESTRICTIVE PROCEDURE IN 80 CASES (95%)
- 79 (94%) WERE ADMITTED TO HOSPITAL FOR WE WITHIN 6 MONTHS OF SURGERY
- FREQUENT VOMITING IN 76 (90%)
- VOMITING LASTED FOR A MEDIAN OF 21 DAYS AT ADMISSION
- BRAIN MRI WITH LESIONS CHARACTERISTIC OF WE IN 14/30 (47%)
- INCOMPLETE RECOVERY IN 41 CASES (49%)
- MEMORY DEFICITS AND GAIT PROBLEMS WERE COMMON SEQUELA

Aasheim, Annals of Surgery, 2008

SYSTEMATIC REVIEW OF WERNICKE'S AFTER BARIATRIC SURGERY 2008

IMPLICATIONS:

- BARIATRIC SURGERY TRAINING PROGRAMS SHOULD INCLUDE EDUCATION ON THE POSSIBLE NUTRITIONAL COMPLICATIONS OF METABOLIC AND BARIATRIC SURGERY

- THIAMINE ADMINISTRATION IS ADVISABLE IN ALL PATIENTS READMITTED OR REPORTING FREQUENT VOMITING AFTER A BARIATRIC PROCEDURE AS A SIMPLE, SAFE, INEXPENSIVE, AND EFFICIENT PREVENTIVE MEASURE

Aasheim, Annals of Surgery, 2008

SYSTEMATIC REVIEW OF WERNICKE'S AFTER BARIATRIC SURGERY 2023

- SINCE 1985, 129 REPORTED CASES OF WERNICKES AFTER MBS:
  - 65 AFTER RYGB, 29 AFTER SLEEVE, 11 AFTER GASTROPLASTY, 8 AFTER BAND, 4 AFTER BPD
- PROLONGED VOMITING IS AN IMPORTANT RISK FACTOR
- MAJORITY OF CASES WERE EARLY:
  - 50% WITHIN 2 MONTHS & 80% WITHIN 4 MONTHS OF SURGERY
- CONCLUSION:
  - EARLY INTERVENTION & POSTOP SUPPLEMENTATION RECOMMENDED TO PREVENT WERNICKE'S

Yu et al, Obesity Surgery, 2023

PRIOR WERNICKE'S GUIDELINES

TABLE 1. SUMMARY OF PRIOR PUBLISHED GUIDELINES

Guidelines	Patients	Initial Thiamine Treatment	Further Treatment
ASMBS 2020	Patients after MBS with Suspected thiamine deficiency.	100-300 mg PO 2-3 times per day, or 200 mg IV tid or 500 mg 1-2 per day for 3-5 d, then 250 mg od 3-5 d	Continue treatment until symptoms resolve, then 100 mg PO OD indefinitely or until risk factors resolve.
ASPEN 2019	Patients with Wernicke's encephalopathy with or without AUD.	With AUD: 500-1500 mg IV, IM Divided into 2-3 doses for 5 days Without AUD: 100-300 mg daily.	Continue IV or IM until symptoms resolve, then 300 po PO daily for 1-2 weeks, then 100 mg PO daily.
EFNS 2010	Patients with Wernicke's encephalopathy.	500 mg IV tid before giving carbs.	Continue treatment until no further improvement in signs & symptoms.
RCP 2002	Patients with Wernicke's encephalopathy in the ED with a history of AUD.	250 mg IV for 3 days.	If no response after 3 days, stop. If response after 3 days, continue for 5 days or until no further improvement.
NIH 2023	Patients with Wernicke's encephalopathy or wet Beriberi (cardiac).	Beriberi or WE: 200 mg IV or PO tid, or 50 mg IM for 2-3 d or until resolution. WKS: 500 mg IV tid for 2 d, then 250 mg IV for 3 d.	Maintenance therapy of 10 mg PO daily.

Patterson et al, SOARD, 2025

ASMBS WERNICKE'S GUIDELINES 2025

TABLE 2. CLINICAL GUIDELINES: PREVENTION, DIAGNOSIS, AND TREATMENT OF WERNICKE'S ENCEPHALOPATHY AND WKS.

Patients	Diagnosis	Initial Treatment	Further Treatment
Primary prevention: PREVENT B1 DEFICIENCY Patients losing weight due to MBS, medications, or other risk factors should start B1 100 mg PO daily for TD and WE prophylaxis at least two weeks prior. Continue while on medications & for at least 3 months post MBS, then min 12 mg po forever.	Symptoms of B1 deficiency: Abdominal pain, nausea, vomiting, or weakness, with nutritional deficiency. Caine criteria for Wernicke's: Nutritional deficiency plus, one of: 1. Confusion 2. Ataxia 3. Eye signs	Secondary prevention: TREAT B1 DEFICIENCY B1 100 mg IV or IM for 1-3 doses or until symptoms resolve & adequate oral intake. Tertiary prevention: TREAT WERNICKE'S B1 500 mg IV tid for a minimum of 5 days & continue until no further improvement.	Replace Mg, K, Ph. Continue initial treatment until symptoms resolve. Daily physical exam: walk with the patient & do ataxia tests. Then, give 300 mg orally 2-3 times daily until risk factors resolve. Then, give 100 mg po daily indefinitely.

Patterson et al, SOARD, 2025

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Patterson et al, SOARD, 2025

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Patients

Primary prevention:
PREVENT B1 DEFICIENCY

Patients losing weight due to MBS, medications, or other risk factors should start B1 100 mg PO daily for TD and WE prophylaxis at least two weeks prior.

Continue while on medications & for at least 3 months post MBS, then min 12 mg po forever.

Diagnosis

Symptoms of B1 deficiency:

Abdominal pain, nausea, vomiting, or weakness, with nutritional deficiency.

Caine criteria for Wernicke's:

Nutritional deficien plus, one of:
1. Confusion
2. Ataxia
3. Eye signs

Initial Treatment

Secondary prevention:
TREAT B1 DEFICIENCY

B1 100 mg IV or IM for 1-3 doses or until symptoms resolve & adequate ora

Tertiary prevention:
TREAT WERNICKE'S

B1 500 mg IV tid for a minimum of 5 days & continue until no further improvement.

Further Treatment

Replace Mg, K, Ph.

Continue initial treatment until symptoms resolve.

Daily physical exam: walk with the patient & do ataxia tests.

Then, give 300 mg orally 2-3 times daily until risk factors resolve.

Then, give 100 mg po daily indefinitely.

Patterson et al, SOARD, 2025

PHARMACOVIGILANCE STUDY & LITERATURE REVIEW OF WERNICKE'S AFTER GLP-1 RAS

- FDA Adverse Event Reporting System (FAERS) 2023-2024
- IDENTIFIED 15 CASES OF GLP-1-ASSOCIATED WERNICKE'S ENCEPHALOPATHY
  - 8 WITH SEMAGLUTIDE, 6 WITH TIRZEPATIDE, 1 OTHER
- 13/15 REPORTED GI MANIFESTATIONS: WEIGHT LOSS, VOMITING, LOSS OF APPETITE, OR MALNUTRITION
- FULL Wernicke's TRIAD IN 2/15 PATIENTS
- 7/11 PATIENTS HAD LONG-TERM NEUROLOGIC SEQUELAE
- DISPROPORTIONALITY ANALYSIS SHOWED INCREASED REPORTING OF WE WITH GLP-1s COMPARED WITH OTHER MEDICATIONS (ROR = 2.35, 95% CI 1.38-4.01)

Lev et al, *Clinical Nutrition*, 2026

WERNICKE-KORSAKOFF SYNDROME (WKS)

80% of patients with untreated Wernicke's encephalopathy progress

Korsakoff syndrome:

Persistent memory deficits, antegrade and retrograde	Persistent deficits in learning	Confabulation (filling in the blanks by fabricating memories)	Rarely resolves	Patients with these sequelae may need permanent institutional care

WERNICKE'S CLOSED CLAIMS STUDY 2026:

ASMBS & CANDELLO

Candello has a National database of 100,734 medical professional liability (MPL) cases

One third of all US open & closed claims, with or without payouts

Descriptive & quantitative analysis of closed claims

METHODS

- Searched the Candello database for **16 years**, from **2009 to 2024** inclusive
- Search terms: **thiamine deficiency, Wernicke's encephalopathy, and WKS**
- Severity of claims graded using the **NAIC severity scale**
- **Descriptive analysis**: legal outcomes, payment amounts, clinical settings, major allegations, services allegedly responsible, comorbidities, final diagnosis, and contributing factors
  - Subgroup analysis planned on **bariatric surgery cases** and **deaths**
- **Statistical analysis**: WE cohort vs Candello database regarding **severity & payouts**

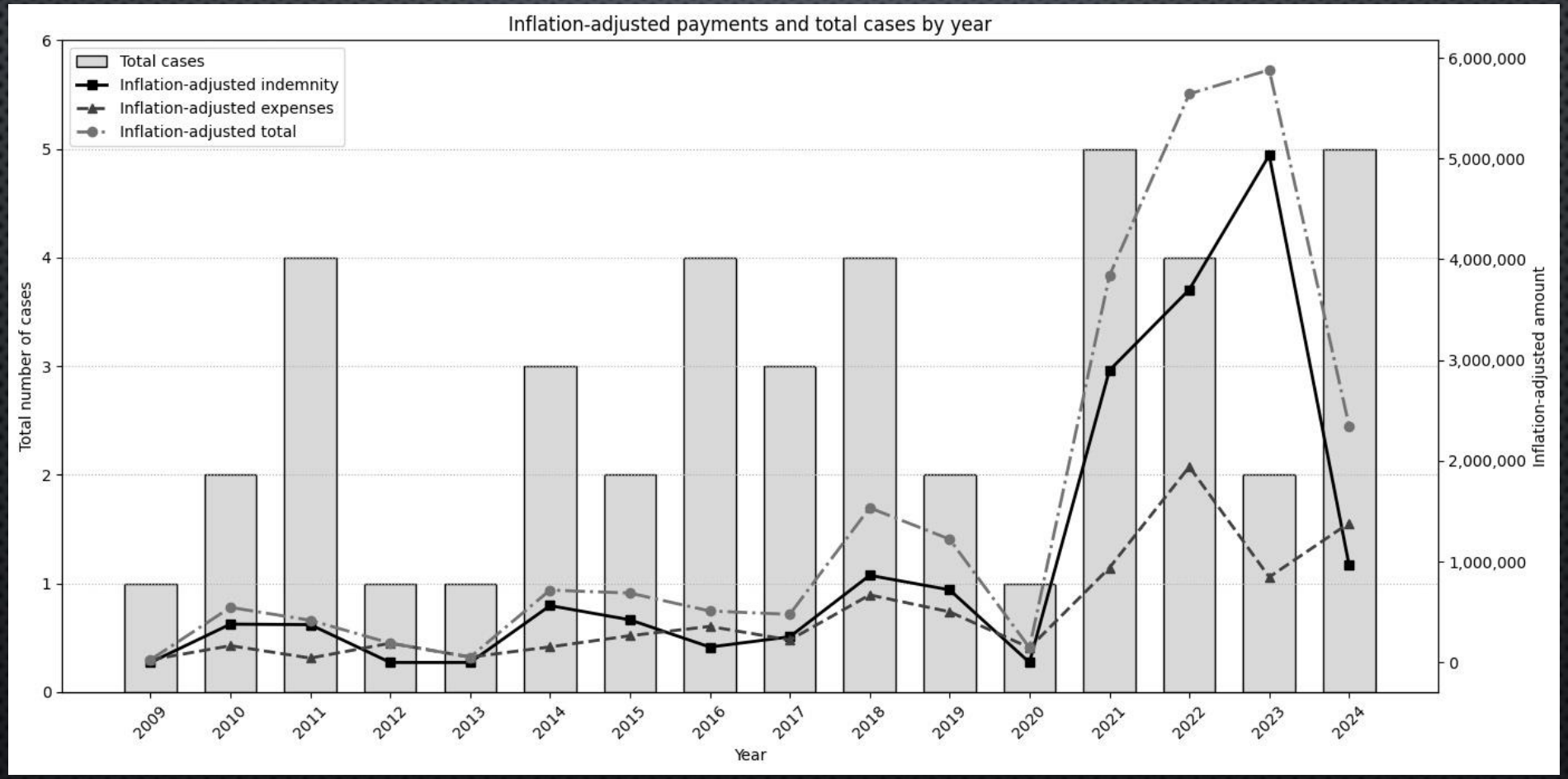
NAIC Injury Severity Scale	Examples
Low Severity	
1. Emotional only	Fright, no physical injury
2. Temporary insignificant	Laceration, contusions, scar or rash
Medium Severity	
3. Temporary minor	Infection, fall in hospital, complete recovery delayed
4. Temporary major	Burns, retained foreign body, complete recovery delayed
5. Permanent minor	Loss of fingers, minor organ damage, not disabling
High Severity	
6. Permanent significant	Deafness, loss 1 limb or eye, or 1 kidney or lung
7. Permanent major	Paraplegia, blindness, loss of 2 limbs, or brain damage
8. Permanent grave	Quadriplegia, severe brain damage, fatal or lifelong care
9. Death	

NATIONAL ASSOCIATION OF INSURANCE COMMISSIONERS
INJURY SEVERITY SCALE (2010)

RESULTS

- **62 cases** identified, including **17 deaths (27%)**
- Total gross paid (indemnity plus expenses) was $20,148,227
- **High-severity injury or death:**
  - **66% of WE cases**, compared to **44%** of Candello (p<0.001)
- **The average indemnity paid** for WE cases was higher
  - **$758K compared to $399K** (p<0.001)
- No significant difference in the % of cases closed with payouts:
  - 29% in WE versus 39% (p>0.05)

INFLATION-ADJUSTED PAYOUTS OVER TIME



HYPOTHESES VS RESULTS

- Over 50% MBS:

  Incorrect: **only 16%** of patients had a history of MBS.

- **Higher severity of Wernicke's cohort**

  Correct: 66% versus 44% high severity

- **Higher payouts in Wernicke's cohort**

  Correct: $758K versus $399K average indemnity payout

- More cases with payouts

  Incorrect: 29% of WE cases had payouts & 39% of Candello ($p > 0.05$)

- Increasing number of cases over time **& increasing payouts over time**

  Incorrect on increasing number of cases; & correct on **increasing payouts**

SUMMARY

- Wernicke's encephalopathy is a clinical diagnosis using the Caine criteria
- Wernicke's is an emergency and largely preventable
- Draw labs and start empiric treatment
- Continue high-dose IV thiamine (500 mg) tid until no further improvement
- Daily physical exam, including observing gait & performing tests for ataxia
- Follow closely after discharge to monitor for recovery or recurrence

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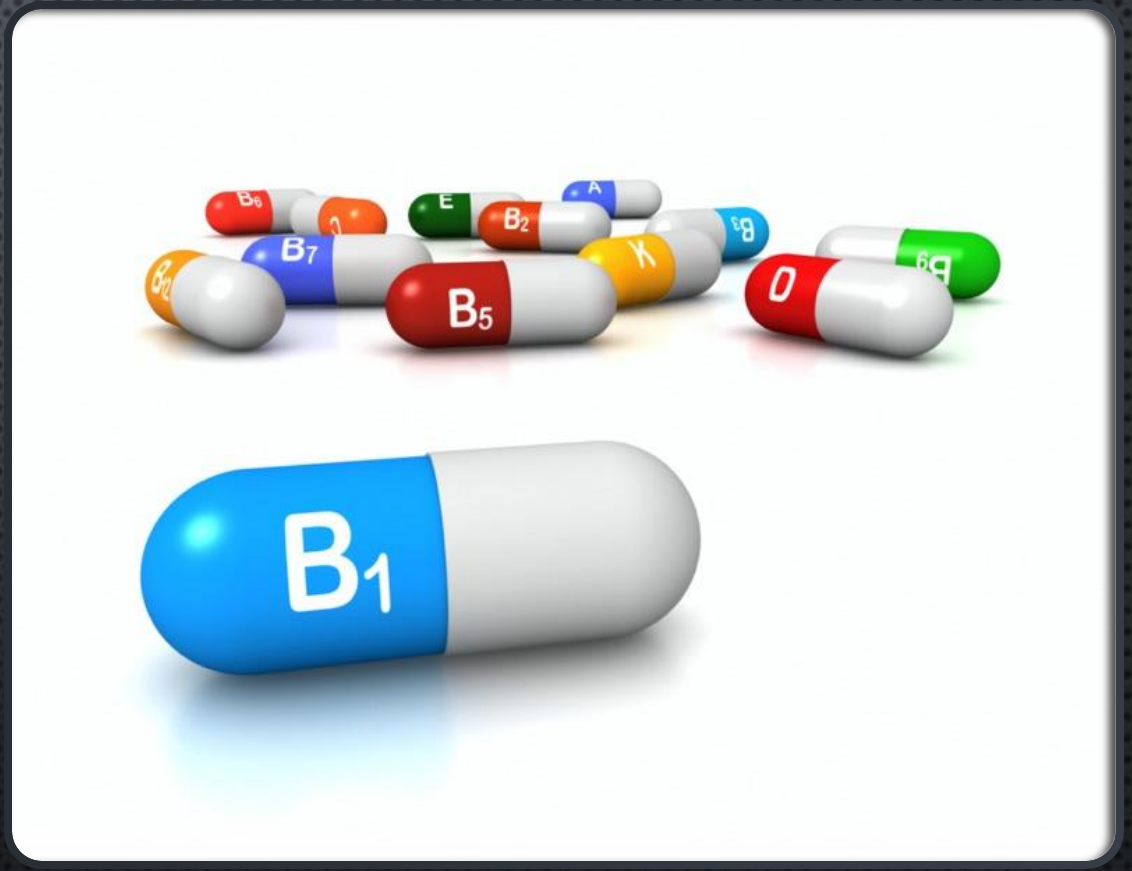

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