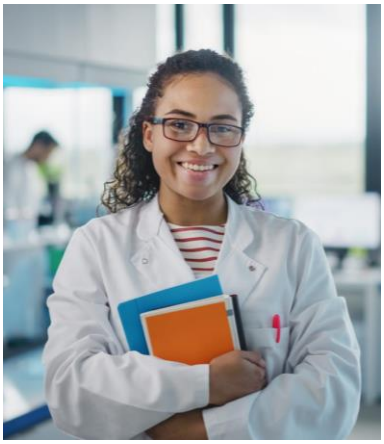
Laboratory Assessment of Nutrition Status: Making Clinical Connections Webinar

Live Webinar: Thursday, December 6, 2023 (2:00-3:00pm ET) Convert to your own time zone



Description and Speaker:
Wondering how to use all the medical data to identify nutrition diagnoses? Learn strategies to make clinical connections between health, physical, diet history, NFPE and lab test results. Consider new tactics to use lab test results as a component of collaborative, person-centered care. Join award winning dietitian, **Dr. Mary Litchford, PhD, RDN, LD** for this webinar to discuss strategies and best practices to make decisions related to nutrition care.

Objectives:
After completing this continuing education course, the learner should be able to:

1. Assess laboratory test results for hydration status, inflammation, nutrition-related anemia, micronutrient deficiencies, and other nutrition-related chronic disorder.
2. Discuss the impact of chronic use of medications associated with impaired nutrient absorption.
3. Apply principles of the Nutrition Care Process in the laboratory assessment of nutritional status.

Disclosure:
Dr. Litchford discloses that she is a consultant for Prosynthesis Labs, Abbott Nutrition and Nestle Nutrition, however, she certifies that no conflict of interest exists for this program.

Professional Approvals:
Becky Dorner & Associates, Inc. has been providing continuing professional education (CPE) since 1983 (Commission on Dietetic Registration provider number NU004).

Intended Audience: RDNs and NDTRs	**CDR Activity Type and Number:** Activity Type: 171 Live webinar/175 Recorded Activity number: 179565 Recorded Webinar: 179564
CPE Hours: 1.0	**CDR Level:** II
Suggested CDR Performance Indicators: 8.12, 8.2.1, 10.2.8	

Note: Numerous Other Performance Indicators May Apply.

Expiration Date for Recorded Webinar: December 6, 2026.

How to Complete a CPE Course:
https://www.beckydorner.com/continuing-education/how-to-complete-cpe/

Questions? Please contact us at info@beckydorner.com

Laboratory Assessment of Nutrition Status: Making Clinical Connections Webinar

Today's Webinar
- Please refer to your handout for instructions

Handouts
- Live: Emailed to the person who registered for the program, and posted in the Go To Webinar System

Recording
- Available on our website with the recording

Questions
- Live: Use GoToWebinar to ask questions
- Recording: Email info@beckydorner.com

Program Length
- 60 minutes

Credit Hours/Certificate
- Please refer to handouts for details

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Thank you!

- **Credit Hours:** Please watch for a follow up email with detailed information on how to obtain your certificate (instructions are also on the next slide).
- **Watch our emails** for upcoming programs.
- **Sign up for free membership** at www.beckydorner.com for free resources, discounts on CPE courses, webinars, publications, and valuable practice tips and tools.

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Certificates

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- Complete Evaluation and Submit. You will be redirected back to the Member Area, within Test/Certificates. Click on the Download button to the right of your completed program to print your certificate and/or save it to your computer. Your certificate will also be emailed to you after you complete this process.

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Laboratory Assessment of Nutrition Status: Making Clinical Connections

Mary D. Litchford PhD, RDN, LDN
mdlphd@casesoftware.com

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- National speaker, author, consultant to HC providers
- President, CASE Software & Books
- Past President of National Pressure Injury Advisory Panel(only the 2nd RDN to ever hold this prestigious position)
- NPIAP representative to the 2019 Guideline Governance Group (1st RDN to serve on this group)
- Author of cutting-edge reference books with CE options including:
  - *Sharpen Your Edge in Nutrition Focused Physical Exams*
- Author of cutting-edge reference books
  - *Laboratory Assessment of Nutritional Status: Bridging Theory & Practice*
  - *Nutrition & Pressure Injuries*

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Disclosures
Consultant to Prosynthesis Labs and President, CASE Software and Books However, there are no conflicts of interest for this webinar

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Objectives

Assess	Assess laboratory test results for hydration status, inflammation, nutrition-related anemia, micronutrient deficiencies, and other nutrition-related chronic disorders.
Discuss	Discuss the impact of chronic use of medications associated with impaired nutrient absorption.
Apply	Apply principles of the Nutrition Care Process in the laboratory assessment of nutritional status.

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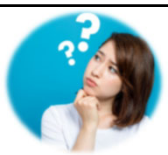
Self-Assessment…

Think about your role on the healthcare team



- Do you feel respected as the nutrition expert by your colleagues?
- Do you feel confident in your ability to explain the rationale and evidence to support your nutrition-related lab assessment recommendations?

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Self-Assessment…

Think about your role on the healthcare team

- When you identify the nutrition diagnosis, what data points are <u>most important</u> to support nutrition recommendations?
  - Food & nutrition history?
  - Client health history?
  - Weight change?
  - Lab test results?
  - NFPE findings?

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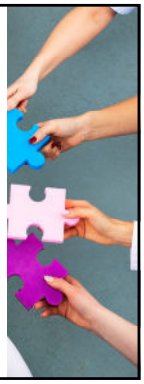
Flash Review 1:
Nutrition-Related Laboratory Tests

- Commonly ordered blood tests
- Urine testing
- Algorithms for evaluating:
  - Water dysregulation
  - Inflammation



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BMP, CMP, CBC

BMP	CMP- includes all tests in BMP PLUS	CBC	
Sodium	ALP	Red Blood Cell Count	
Potassium	AST	White blood Cell Count	
Chloride	ALT	Platelets	
Carbon Dioxide content (CO2)	Bilirubin	Hemoglobin	
Blood Urea Nitrogen	Total Protein	Hematocrit	
Serum Creatinine	Albumin	Mean Corpuscular Value	
Serum Glucose	Globulin	Differential Count	
Total Calcium		Neutrophils Eosinophils Basophils	Lymphocytes Monocytes

Biomarkers Definitions Working Group: Biomarkers and surrogate endpoints: Preferred Definitions and conceptual; framework *Clin Pharmacol Ther* 2001;69:89-95.
Pagana, K. *Mosby's Diagnostic and Laboratory Test Reference*. 11th edition. St. Louis, MO: Elsevier. 2019.

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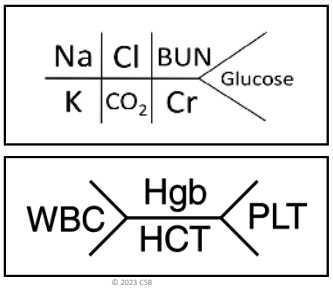
Simplified BMP & CBC



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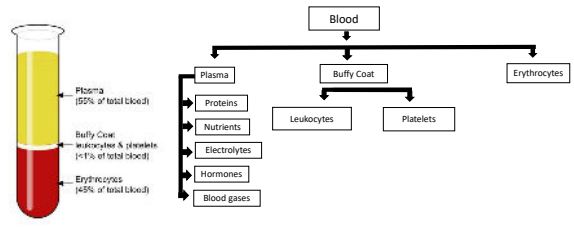
Types of Specimens: Nutrition Relationships



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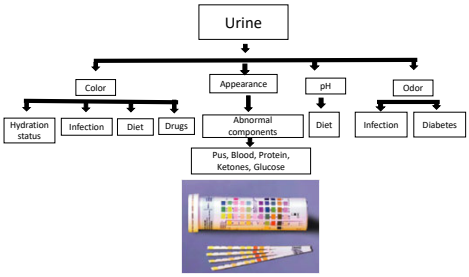
Types of Specimens: Nutrition Relationships



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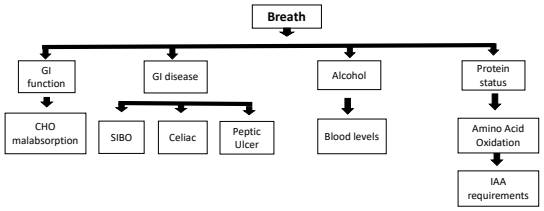
Types of Specimens: Nutrition Relationships



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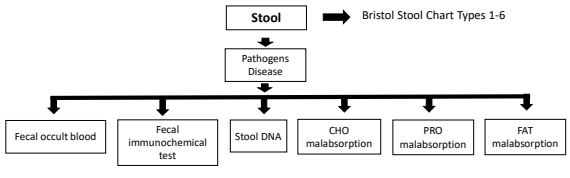
Types of Specimens: Nutrition Relationships



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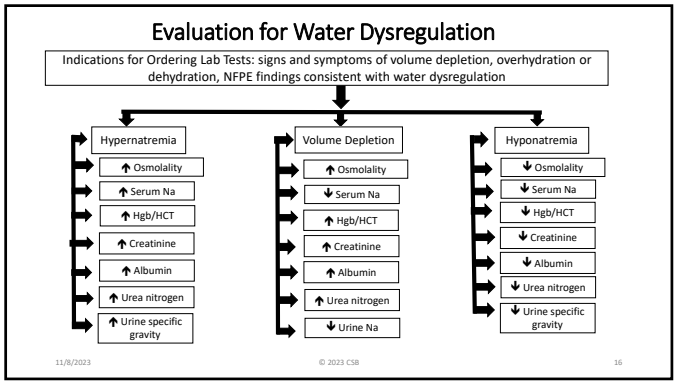
Evaluation for Water Dysregulation
Indications for Ordering Lab Tests: signs and symptoms of volume depletion, overhydration or dehydration, NFPE findings consistent with water dysregulation
Hypernatremia
↑ Osmolality
↑ Serum Na
↑ Hgb/HCT
↑ Creatinine
↑ Albumin
↑ Urea nitrogen
↑ Urine specific gravity
Volume Depletion
↑ Osmolality
↓ Serum Na
↑ Hgb/HCT
↑ Creatinine
↑ Albumin
↑ Urea nitrogen
↓ Urine Na
Hyponatremia
↓ Osmolality
↓ Serum Na
↓ Hgb/HCT
↓ Creatinine
↓ Albumin
↓ Urea nitrogen
↓ Urine specific gravity
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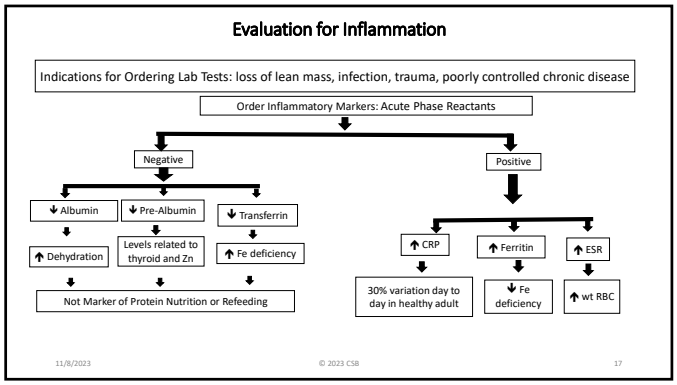
Evaluation for Inflammation
Indications for Ordering Lab Tests: loss of lean mass, infection, trauma, poorly controlled chronic disease
Order Inflammatory Markers: Acute Phase Reactants
Negative
Positive
↓ Albumin
↓ Pre-Albumin
↓ Transferrin
↑ Dehydration
Levels related to thyroid and Zn
↑ Fe deficiency
Not Marker of Protein Nutrition or Refeeding
↑ CRP
↑ Ferritin
↑ ESR
30% variation day to day in healthy adult
↓ Fe deficiency
↑ wt RBC
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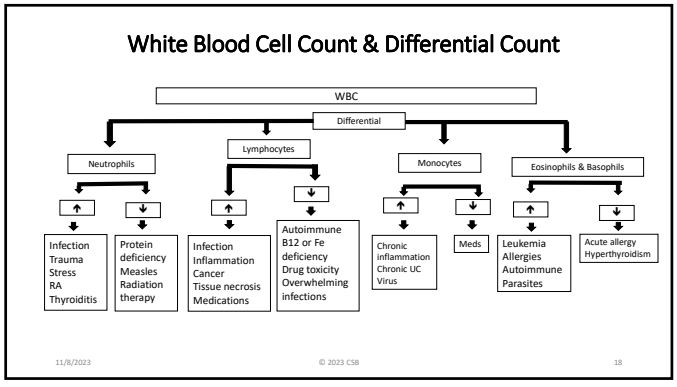
White Blood Cell Count & Differential Count
WBC
Differential
Neutrophils
Lymphocytes
Monocytes
Eosinophils & Basophils
↑
↓
↑
↓
↑
↓
↑
↓
Infection
Trauma
Stress
RA
Thyroiditis
Protein deficiency
Measles
Radiation therapy
Infection
Inflammation
Cancer
Tissue necrosis
Medications
Autoimmune
B12 or Fe deficiency
Drug toxicity
Overwhelming infections
Chronic inflammation
Chronic UC
Virus
Meds
Leukemia
Allergies
Autoimmune
Parasites
Acute allergy
Hyperthyroidism
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Case Study 1: Basic Data

- CM is 75 yr old male admitted to City Hospital from PAC with severe gastric pain & cramping. Nursing notes vomiting multiple times in the last 48 hrs. Prior to acute illness, recent food intake unchanged except for eating out with family 5 days ago. He is unable to tolerate liquids or solid foods. Started on IV fluids.
- Health history: recent falls, atrial fib, heart failure, diabetes, hypertension, peptic ulcer disease
- Med: anticoagulant, diuretic, antihyperglycemic, antihypertensive, PPI
- Ht 180 cm, 104 kg, BMI 32; BP 90/60; HR 110, NFPE- confused, dry skin and mucous membranes, multiple skin tears and possible DTI from recent fall
- What additional information would be helpful?

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Case Study 1: What additional information would be helpful?

- Additional data needed or helpful from PAC: When was most recent fall? Was CM injured in fall? Changes in weight, dietary intake of energy & protein, skin condition, hx of micronutrient deficiencies?
- Data from family: Recent family illness D/T GI virus or food borne illness; Food consumed by CM at restaurant, Any take-out food stored in resident's room? Any chronic alcohol consumption or at meal?
- Possible consequences of acute illness: dehydration, edema, stress to CVD status and glycemic control. Started on IV fluids.

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Case Study 1: What 'Red Flags' do you see?

- CM: acutely ill, 75 yr old M, **GI sx x 48 hr**. Admitted to Hospital from PAC with severe gastric pain & cramping. Nursing notes **vomiting multiple times** in the last **48 hrs**. He is **unable to tolerate liquids or solid foods.**
- Additional data needed or helpful from PAC: when was most recent fall? **24 hr prior to hospital admission**, was CM injured in fall? **Unknown**, changes in weight- **↓3 kg since onset**, hx dietary intake of energy & protein- **good intake except for some meats and eggs**, skin condition- **hx skin tears and pressure injuries**, history of micronutrient deficiencies- **anemia**
- Data from family: recent family illness D/T GI virus or food borne illness-**none**; food consumed by CM at restaurant- **same as others**, any take-out food stored in resident's room- **yes**, stored properly? **Unknown,** any chronic alcohol consumption or at meal- **drinks alcohol at all family gatherings**
- Possible **consequences of acute illness: dehydration, edema, stress to CVD status and glycemic control. Started on IV fluids.**

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Case Study 1: Historic vs. Hospital Admission Data

Laboratory test (reference values)	Historic data from PAC	D-1 Hospital Admission
Osmolality (285-295 mmol/kg H2O)	290	305
Sodium (136-146 mmol/L)	135	145
Chloride (98-106 mmol/L)	99	106
Glucose, fasting (4.1- 5.9 mmol/L)	5.9 (F)	12 (NF)
UN/CR (3.6-7.1 mmol/L; 53-106 µmol/L)	6.6/96	14/112
ALP/AST/ALT (0.5-2.0 µKat/L; 0-.58 µKat/L; 30-120 U/L)	0.8/0.43/32	0.6/0.44/31
Hgb/HCT/MCV, (8.7-11.2 mmol/L; 0.42-0.52; 80-95 fL)	13/0.45/92	11/0.47/99
Albumin (35-50 g/L); PAB (150-360 mg/L)	3.9/300	5.5/420
A1c (> 5.7%)	6.9%	7%

BUN- Blood Urea Nitrogen
CR- Creatinine
ALP- Alkaline Phosphatase
AST- Aspartate Aminotransferase
ALT- Alanine Aminotransferase
Hgb- Hemoglobin
HCT- Hematocrit
MCV- Mean Corpuscular Volume
A1c- Glycated Hemoglobin

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Case Study 1 : Interpretation

Laboratory test	Historic data from PAC	D-1 Hospital Admission	Comments
Osmolality mmol/kg H2O	290	305	↑ Dehydration acute illness
Sodium mmol/L	135	145	↑ Dehydration acute illness
Chloride mmol/L	99	106	↑ Dehydration acute illness
Glucose mmol/L	5.9	12	↑ Poorly managed DM & Dehydration acute illness
UN/CR mmol/L, µmol/L	6.6/96	14/112	↑ Poorly managed DM & Dehydration acute illness
ALP/AST/ALT µKat/L, µKat/L, U/L	0.8/0.43/32	0.6/0.44/31	WNL
Hgb/HCT/MCV, mmol/L, fL	13/0.45/92	11/0.47/99	↑ Dehydration acute illness
Albumin /PAB, g/L, mg/L	3.9	55	↑ Dehydration acute illness
A1c	6.9%	7%	Fair control T2 DM

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CASE Study 1 Follow Up at Discharge

Laboratory test	Historic data from PAC	D-1 Hospital Admission	D-3 Hospital D/C	Comments
Osmolality mmol/kg H2O	290	305	282	
Sodium mmol/L	135	145	129	
Chloride mmol/L	99	106	92	
Glucose mmol/L	5.9 (F)	12 (NF)	6.2 (F)	
UN/CR mmol/L, µmol/L	6.6/96	14/112	8/88	
ALP/AST/ALT µKat/L, µKat/L, U/L	0.8/0.43/32	0.6/0.44/31	0.7/0.40/30	
Hgb/HCT/MCV, mmol/L, fL	13/0.45/92	11/0.47/99	7.8/0.37/95	
Albumin /PAB, g/L, mg/L	39/ NA	55/399	40/NA	
A1c	6.9%	7%	NA	

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CASE Study 1 Follow Up at Discharge

Laboratory test	Historic data from PAC	D-1 Hospital Admission	D-3 Hospital D/C	Comments
Osmolality mmol/kg H2O	290	305	282	Slightly low
Sodium mmol/L	135	145	129	↓ ? overhydration
Chloride mmol/L	99	106	92	↓ ? overhydration
Glucose mmol/L	5.9 (F)	12 (NF)	6.2 (F)	Improved
UN/CR mmol/L, µmol/L	6.6/96	14/112	8/88	Improved
ALP/AST/ALT µKat/L, µKat/L, U/L	0.8/0.43/32	0.6/0.44/31	0.7/0.40/30	WNL
Hgb/HCT/MCV, mmol/L, fL	13/0.45/92	11/0.47/99	7.8/0.37/95	↓ ? anemia
Albumin /PAB, g/L, mg/L	39/ NA	55/399	40/NA	↓ ? inflammation
A1c	6.9%	7%	NA	Follow up in 30-90 days

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CASE Study 1

- Factors that contribute to abnormal lab tests
  - Acute illness contributes to water dysregulation
  - Acute illness contributes to increased inflammation
  - Acute illness is disruptive to chronic disease management
  - Medications that may contribute to abnormal lab test results:
    - Diuretic Lasix: Sodium, potassium, magnesium, zinc, calcium, thiamine
    - Antihyperglycemic Metformin: B12
    - Antihypertensive: zinc, potassium
    - PPI: Calcium, magnesium, copper, iron, folate, B12
- Other concerns
  - Skin issues and adequate intake of energy and protein
  - ? Risk for thiamine deficiency & anemia

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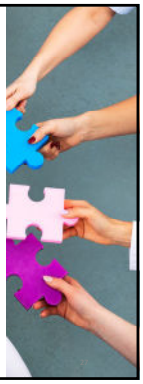
Flash Review 2:
Nutrition-Related Laboratory Tests

- Algorithms for evaluating:
  - Anemia
  - Micronutrient deficiencies
  - Selected chronic diseases



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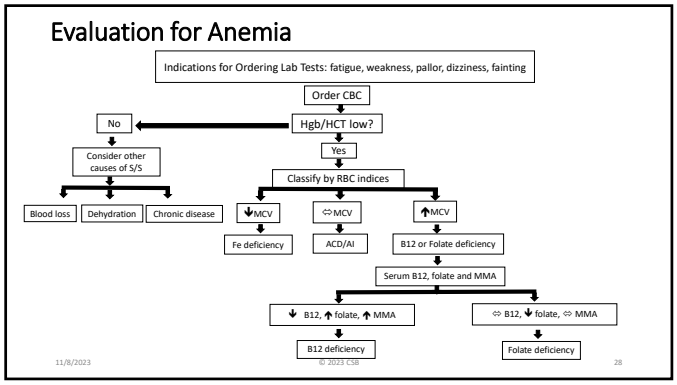
Evaluation for Anemia
Indications for Ordering Lab Tests: fatigue, weakness, pallor, dizziness, fainting
Order CBC
Hgb/HCT low?
No
Consider other causes of S/S
Blood loss
Dehydration
Chronic disease
Yes
Classify by RBC indices
↓MCV
Fe deficiency
⇔MCV
ACD/AI
↑MCV
B12 or Folate deficiency
Serum B12, folate and MMA
↓ B12, ↑ folate, ↑ MMA
B12 deficiency
⇔ B12, ↓ folate, ⇔ MMA
Folate deficiency
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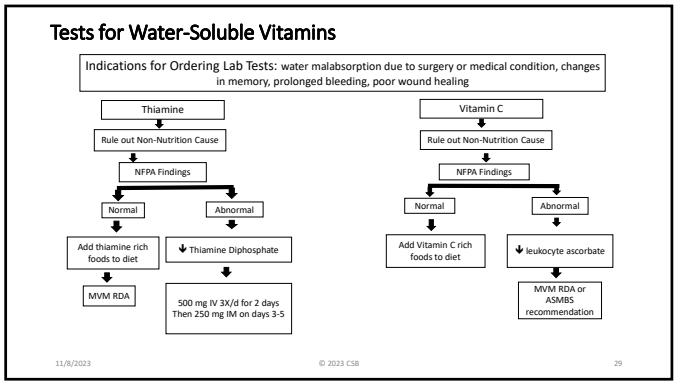
Tests for Water-Soluble Vitamins
Indications for Ordering Lab Tests: water malabsorption due to surgery or medical condition, changes in memory, prolonged bleeding, poor wound healing
Thiamine
Rule out Non-Nutrition Cause
NFPA Findings
Normal
Abnormal
Add thiamine rich foods to diet
MVM RDA
↓ Thiamine Diphosphate
500 mg IV 3X/d for 2 days
Then 250 mg IM on days 3-5
Vitamin C
Rule out Non-Nutrition Cause
NFPA Findings
Normal
Abnormal
Add Vitamin C rich foods to diet
↓ leukocyte ascorbate
MVM RDA or ASMBS recommendation
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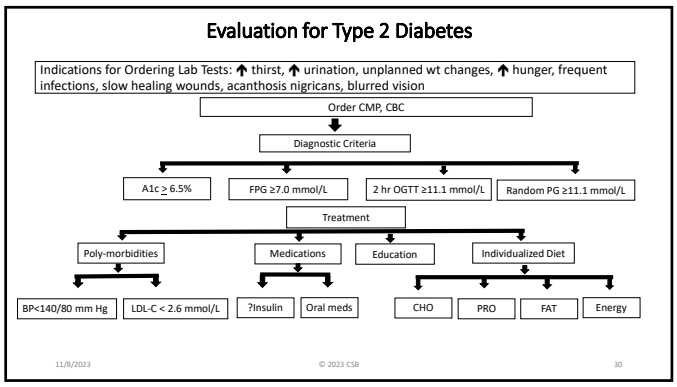
Evaluation for Type 2 Diabetes
Indications for Ordering Lab Tests: ↑ thirst, ↑ urination, unplanned wt changes, ↑ hunger, frequent infections, slow healing wounds, acanthosis nigricans, blurred vision
Order CMP, CBC
Diagnostic Criteria
A1c ≥ 6.5%
FPG ≥7.0 mmol/L
2 hr OGTT ≥11.1 mmol/L
Random PG ≥11.1 mmol/L
Treatment
Poly-morbidities
Medications
Education
Individualized Diet
BP<140/80 mm Hg
LDL-C < 2.6 mmol/L
?Insulin
Oral meds
CHO
PRO
FAT
Energy
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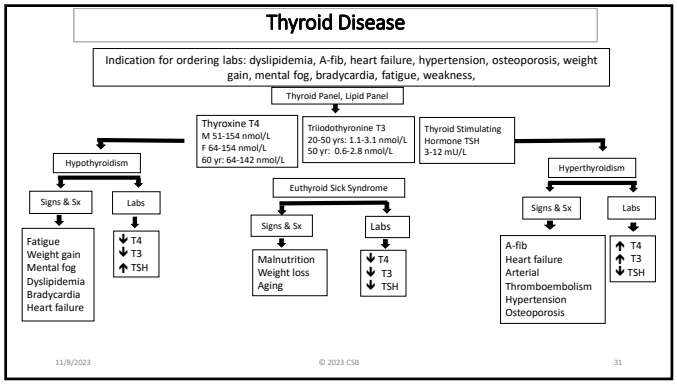

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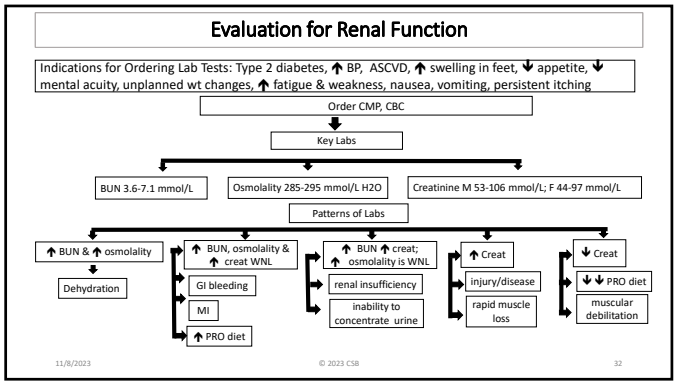

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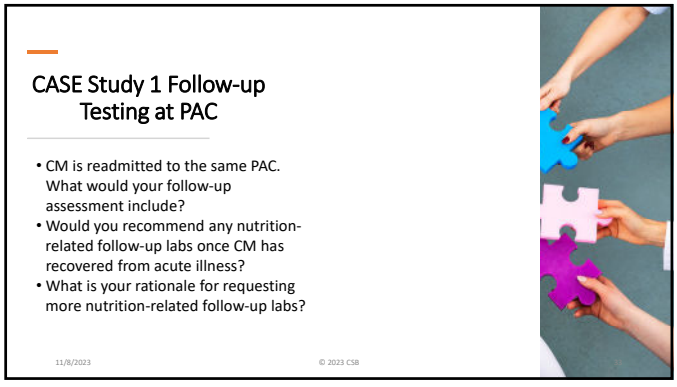

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Case Study 1: Basic Data During Re-Admission

- CM is 75 yr old male D/C from Hospital with resolved GI distress and water dysregulation.
- Health history: no new falls, atrial fib, heart failure, diabetes, hypertension, peptic ulcer disease
- Med: anticoagulant, diuretic, antihyperglycemic, antihypertensive, PPI
- Ht 180 cm, 96 kg, BMI 29.6; BP 140/90; HR 92

Is CM at risk of or malnourished?

Review labs in the context of recent acute illness

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CASE Study 1 Follow Up at Discharge

Laboratory test	Historic data from PAC	D-1 Hospital Admission	D-3 Hospital D/C	Comments
Osmolality mmol/kg H2O	290	305	282	Slightly low
Sodium mmol/L	135	145	129	↓ ? overhydration
Chloride mmol/L	99	106	92	↓ ? overhydration
Glucose mmol/L	5.9 (F)	12 (NF)	6.2 (F)	Improved
UN/CR mmol/L, µmol/L	6.6/96	14/112	8/88	Improved
ALP/AST/ALT µKat/L, µKat/L, U/L	0.8/0.43/32	0.6/0.44/31	0.7/0.40/30	WNL
Hgb/HCT/MCV, mmol/L, fL	13/0.45/92	11/0.47/99	7.8/0.37/95	↓ ? anemia
Albumin /PAB, g/L, mg/L	39/ NA	55/399	40/NA	↓ ? inflammation
A1c	6.9%	7%	NA	Follow up in 30-90 days

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Case Study 1: Historic vs. Hospital D/C vs Now

Laboratory test (reference values)	Historic data from PAC	D-3 Hospital D/C	PAC 2 wks post Readmission
Osmolality (285-295 mmol/kg H2O)	290	282	NA
Sodium (136-146 mmol/L)	135	129	133
Chloride (98-106 mmol/L)	99	92	96
Glucose, fasting (4.1- 5.9 mmol/L)	5.9 (F)	6.2 (F)	5.7 (F)
UN/CR (3.6-7.1 mmol/L; 53-106 µmol/L)	6.6/96	8/88	8.6/107
ALP/AST/ALT (0.5-2.0 µKat/L; 0-.58 µKat/L; 30-120 U/L)	0.8/0.43/32	0.7/0.40/30	1.1/0.44/41
Hgb/HCT/MCV, (8.7-11.2 mmol/L; 0.42-0.52; 80-95 fL)	13/0.45/92	7.8/0.37/95	6.1/0.33/103
Albumin (35-50 g/L); PAB (150-360 mg/L)	3.9/300	40/NA	2.9/NA
A1c (> 5.7%)	6.9%	NA	NA
B12/Folate/MMA-U;118-701 pmol/L; 7-45.3 nmol/L; < 5 mg/d	NA	NA	100/17/6.8
T4 (60 y+ 64-142 nmol/L); TSH (3-12 mU/L)	NA	NA	54/17.2

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CASE Study 1 Follow-up Testing at PAC

- Identify problems that can be addressed with nutrition dx.
- Write a PES statement to address each nutrition related problem.
- Does CM have any other medical issues that need to be addressed or followed up by healthcare team?

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CASE Study 1 Follow-up Testing at PAC

- Identify problems that can be addressed with nutrition dx.
- Possibilities: malnutrition, skin health issues, inadequate protein intake, vitamin 12 deficiency, impaired nutrient absorption r/t meds or alcohol intake

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CASE Study 1 Follow-up Testing at PAC

- Identify problems that can be addressed with nutrition dx.
- Select 1-2 problems and write a PES statement to address the nutrition related problems.

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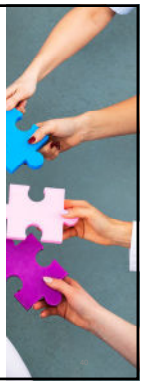
CASE Study 1 Follow-up Testing at PAC

- Does CM have any other medical issues that need to be addressed by healthcare team?
- Possibilities: management of diabetes, alcohol intake, hypothyroidism, GI bleeding r/t PUD and alcohol intake, falls risk/sarcopenia



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Questions

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