

Nutrition and Cancer

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Faculty/Presenter Disclosure

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Nutrition in Cancer
- **Relationships with commercial interests:**
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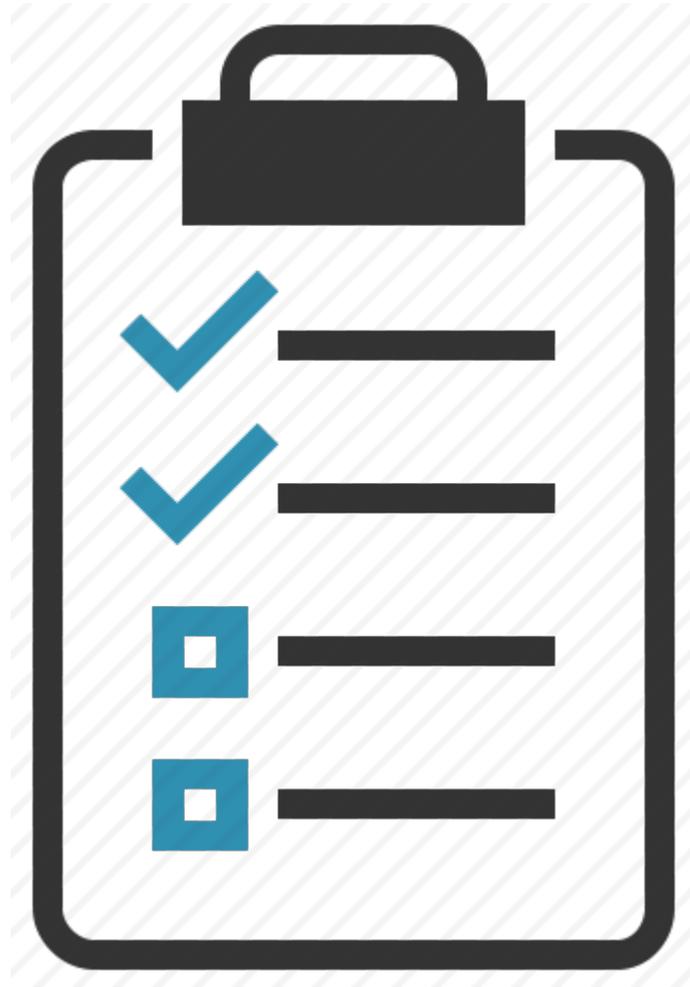


Disclosure of Commercial Support

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Learning Objectives

- ▶ Effect of cancer on nutrition status
- ▶ Nutrition and cancer: Hot Topics
- ▶ Physical and biochemical assessment
- ▶ Diabetes and cancer
- ▶ Actual needs and recommendations
- ▶ Vitamin/supplementation
- ▶ Special considerations





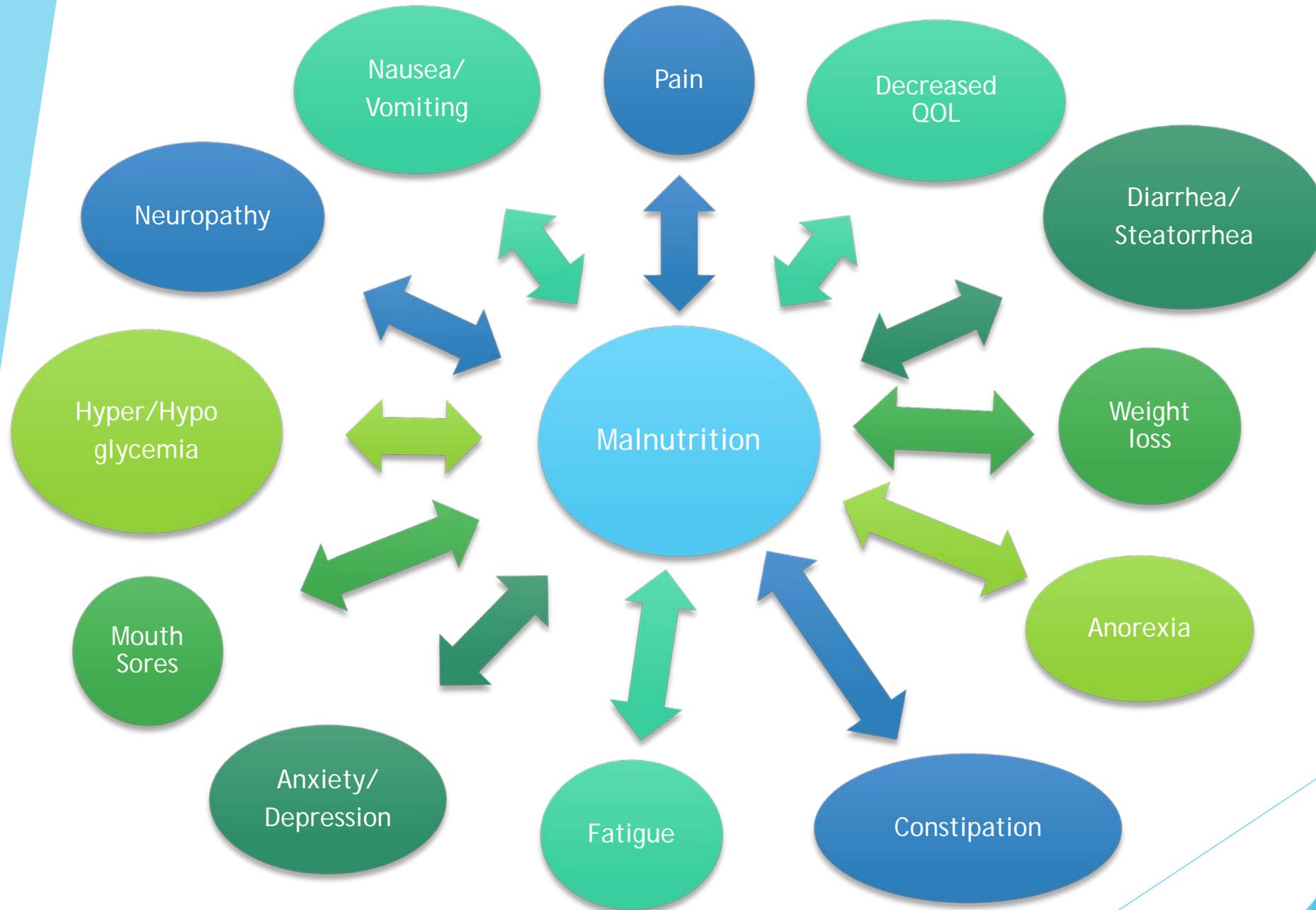
Cancer and Malnutrition



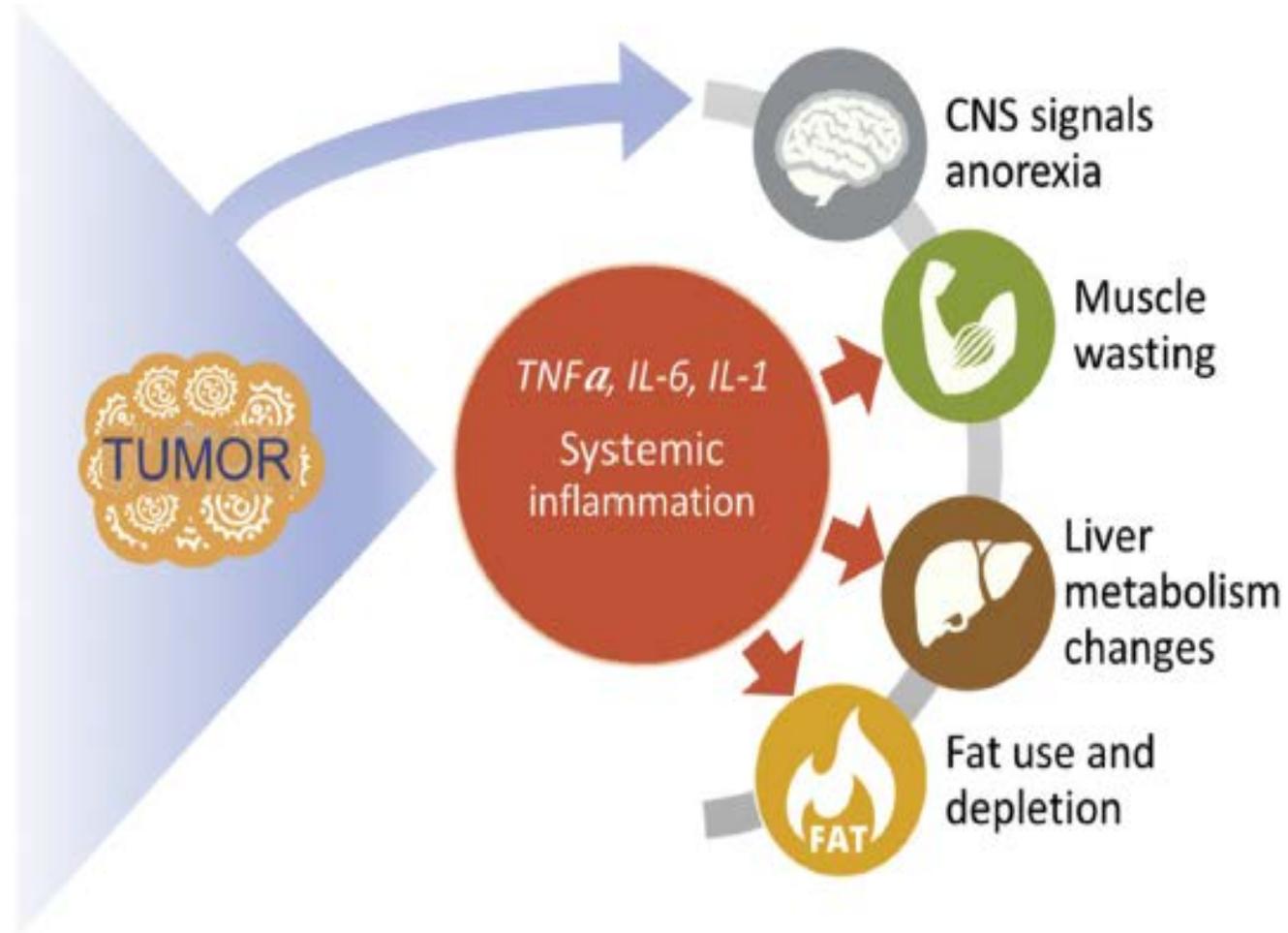
- ▶ Cancer is associated with rapid and extensive weight loss (muscle loss or sarcopenia seen in 15-50%).

(Nutr. In Clin. Practice. 2017 Feb; Vol.32, No.1, 30-39)

- ▶ Malnutrition is a frequent problem in cancer patients.
 - ▶ up to 45% patients admitted to hospital are found to be malnourished.
 - ▶ The prevalence among cancer patients has been estimated to range between 40% and 80%.
(Gomez Candela et. al., J. Nutricion Hsopitalari. 2010, 25(3), 400-405)
- ▶ Est. 10-20% deaths in cancer attributed to malnutrition rather than malignancy
- ▶ Malnutrition associated w/: sarcopenia, cachexia, ↓ immune competence, ↑infections, stress, ↓ QOL, treatment toxicity and greater mortality.



Tumour Mediated Malnutrition



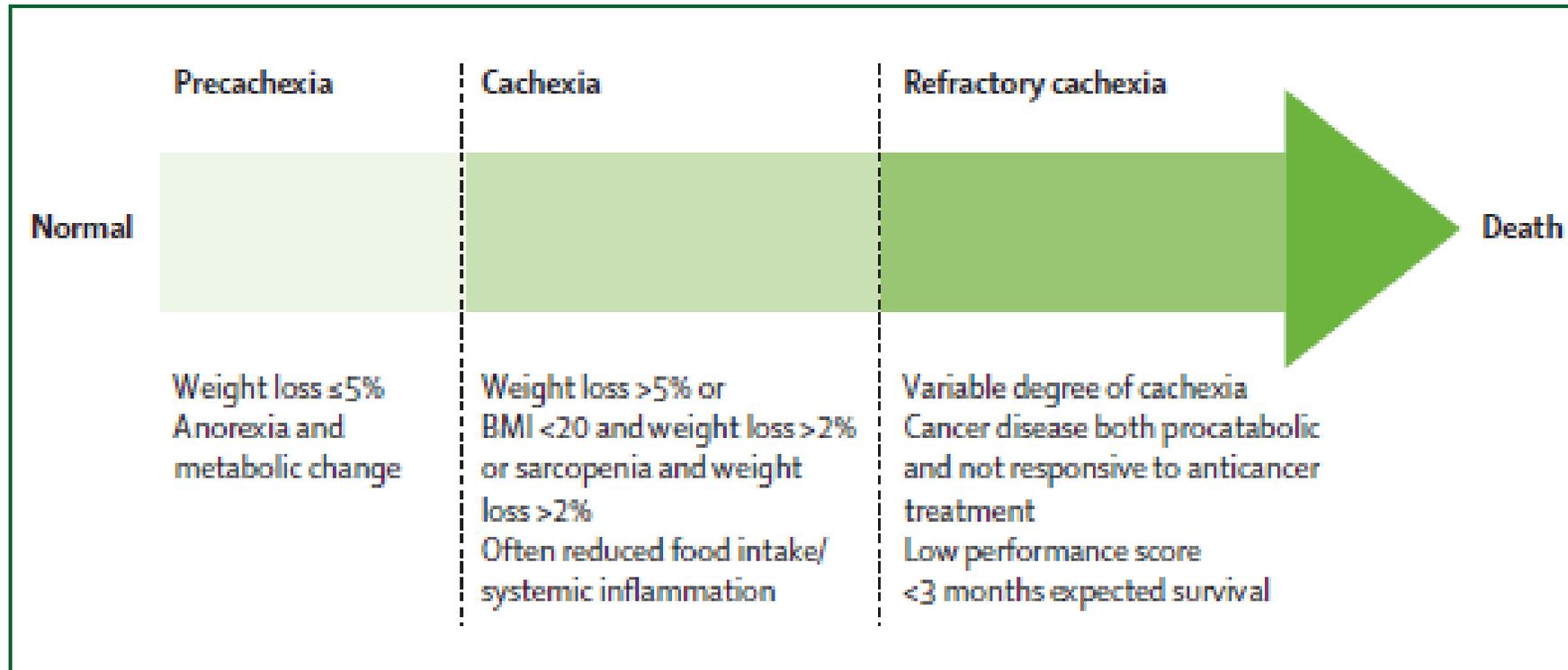


Figure 2: Stages of cancer cachexia

Cachexia represents a spectrum through which not all patients will progress. At present there are no robust biomarkers to identify those precachectic patients who are likely to progress further or the rate at which they will do so. Refractory cachexia is defined essentially on the basis of the patient's clinical characteristics and circumstances.

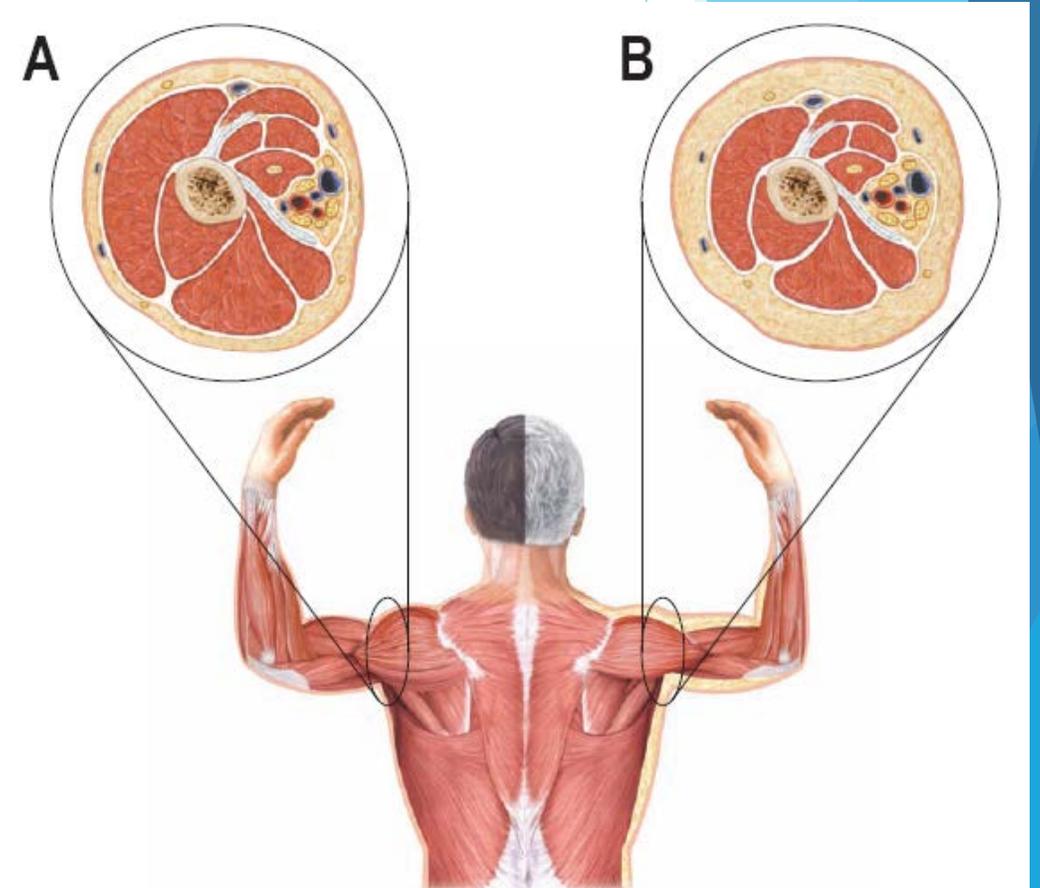
BMI=body-mass index.

Malnutrition/Sarcopenia

- ▶ Inadequate nutritional intake is confirmed if pt can't eat for a week or intake is <60% of requirements. **

Sarcopenia:

- ▶ Now confirmed, can occur concurrently w/ obesity.
- ▶ Associated with ↑ incidence of chemo toxicity, shorter time to tumour progression, physical disability, poor surgical outcomes, ↓ survival





Hot Topics

Quiz time: Who am I?

- A. Acai
- B. Goji
- C. Blueberry
- D. Spinach
- E. Chia



- ▶ Marketing term with no set criteria or scientific basis
- ▶ Most have few studies associated with them and inconclusive results
- ▶ Can be costly compared to items with nutritional equivalence



FOLATE

Beans
Asparagus
Green leafy vegetables

IRON

Oatmeal
Tofu
Beans
Meats

VITAMIN C

Citrus fruits
Peppers
Broccoli

VITAMIN B12

Eggs
Milk
Meats

ZINC

Fish
Pumpkin seeds
Legumes

FLAVONOIDS

Onions
Apples
Soy Beans

CAROTENOIDS

Squash
Sweet potato
Carrots



The Alkaline Diet can prevent or help treat cancer.

- A. True
- B. Myth
- C. Unsure - more evidence needed





Alkaline Diet

- ▶ “Cancer cells thrive in an acidic environment. Eating an alkaline diet will change the pH of your cells so cancer can’t survive”.
- ▶ **The Truth:** Our bodies are excellent at regulating pH within a very narrow range, any change would be life threatening. The basis of the ash-acidic and ash-alkaline is not representative of their non-incinerated pH. More research needed to determine the consequences of a foods potential renal acid load (PRAL) on cancer risk/treatment.
- ▶ “Alkaline Diet” excludes many high protein choices, not replaced, significant concern for cancer patients.
- ▶ Drinking alkaline water cannot change the pH of the whole body of blood.

****A diet high in fruit and vegetables is beneficial for overall health.**

Sugar Feeds Cancer!

- ▶ Belief that sugar preferentially “feeds” cancer cells or directly fuel their growth.
- ▶ Belief that all sugar, sweets, pop and carbohydrates like pasta, rice, grains, cereals contain sugar and should be avoided.
- ▶ Patients frequently call in or report that “sugar causes cancer, so what can I eat”?





The Facts



- ▶ All cells prefer glucose for energy
- ▶ Even without any carbohydrate in the diet, your body will make sugar from other sources, including protein and fat
- ▶ Research shows sugar's relationship to ↑ insulin levels and related growth factors → influence cancer cell growth and ↑ risk of other chronic diseases.
- ▶ Many types of cancer cells have ++ insulin receptors, making them respond more than normal cells to insulin's ability to promote growth
- ▶ Sugar and beverages add substantial calories, promote weight gain (adverse outcomes/risk ie.breast/prostate).



Sugar: What we recommend

- ▶ Avoid added sugars:
 - ▶ Hidden in pasta sauce, salad dressing, canned vegetables, processed foods.
 - ▶ Other disguised names: fructose, lactose, sucrose, glucose, maltose.
 - ▶ Simple Carbohydrates vs complex. GI
- ▶ Approximate Recommended Maximum Intake of Added Sugar Age, in teaspoons
 - ▶ Children: 8
 - ▶ Youth: 10.5
 - ▶ Teenagers: 13
 - ▶ Female adults: 11.5
 - ▶ Male adults: 15
- ▶ 1 Can of regular cola has 19tsp

How does this impact our patients?

- ▶ Misinformation can produce anxiety, fear and unnecessary weight loss or gain and fatigue.
- ▶ Eliminating all sugars (simple and complex) can impair overall health in the form of energy for activity, healing and disease-fighting nutrients.
- ▶ Avoiding natural sugars such as fructose, lactose can take out many key food groups from diet, leaving little choice, taste and satisfaction.



Ketogenic Diet in Cancer Care

- ▶ Pre-clinical and early clinical evidence that ketogenic diets can influence cancer progression is promising.
- ▶ Ketogenic diets are safe and tolerable but require effort to implement and maintain (medical & nutritional monitoring is highly recommended).
- ▶ Risk factors: Weight loss, micronutrient malnutrition, dehydration/electrolyte imbalance.
- ▶ Pt's need ++ education & training in order to safely implement, clinician and dietitian's need help to guide informed decision-making, assist patients and educate the medical community.
- ▶ More clinical research is needed (and is underway).
- ▶ Development of a clinical protocol.



Ketogenic Diet

- ▶ Very high fat diet, low carbohydrate (CHO) and protein(PRO). Example (~75-90%kcal/fat, 10-15%kcal/protein, 5-10%kcal/CHO) 20-30g CHO/d
- ▶ Body switches from burning glucose to burning fat for energy
- ▶ Carbohydrate restriction and fasting promote ketosis or the formation of ketone bodies;
 - ▶ beta-hydroxybutyrate (found in blood; most prevalent)
 - ▶ acetoacetate (found in urine)
 - ▶ acetone (found in the breath)
- ▶ Ketone bodies can be used as an alternative energy source for normal cells but not cancer cells.





Hyperglycemia & Cancer

- ▶ Although the exact mechanisms are still not clear, research shows that hyperglycemia may contribute to *enhanced*;
 - ▶ cancer cell proliferation
 - ▶ apoptosis inhibition
 - ▶ metastasis
 - ▶ perineural invasion
 - ▶ chemotherapy resistance
 - ▶ reduced treatment tolerance
- ▶ Inconsistencies in measuring and assessing hyperglycemia in cancer patients².
- ▶ Lack of standardized guidelines in treating hyperglycemia.

“It’s ok, I can stand to lose some weight during treatment!”

- ▶ Patients with increased body weight/obesity is becoming more common
- ▶ Patients often say “oh I have a few pounds to lose anyways”
- ▶ Patients are aware of the side effects of cancer treatment, and how it impacts their ability to maintain their weight
- ▶ Just because this weight loss is ‘easy’ doesn’t mean its healthy or safe!





How does this impact our patients?

- ▶ There is a time and place for weight loss - during cancer treatment isn't that place
- ▶ Under stress the body preferentially breaks down muscle. Decreased muscle mass = Sarcopenia: decreased function, decreased energy, decreased ability to tolerate chemo and a longer road to recovery
- ▶ For the majority of patients: focus on weight stability
- ▶ Weight loss may be indicated under supervision of a dietitian and physician (breast, prostate)
- ▶ Post treatment, focus on a healthy diet

Why Nutrition Matters

Optimized nutritional status leads to...

- **Increased** life span
- **Increased** tolerance to treatment, prevent delays
- **Decreased** fatigue
- **Wound healing**
- **Improved** immunity/ fight infection
- Preserve lean body mass
- Maintain hydration status
- Maintain healthy bowel function



Assessing Patient's Nutrition Status:

Canadian Nutrition Screening Tool (CNST)

2 Questions, help indicate if consult to dietitian now!

Ask the patient the following questions* Yes or No

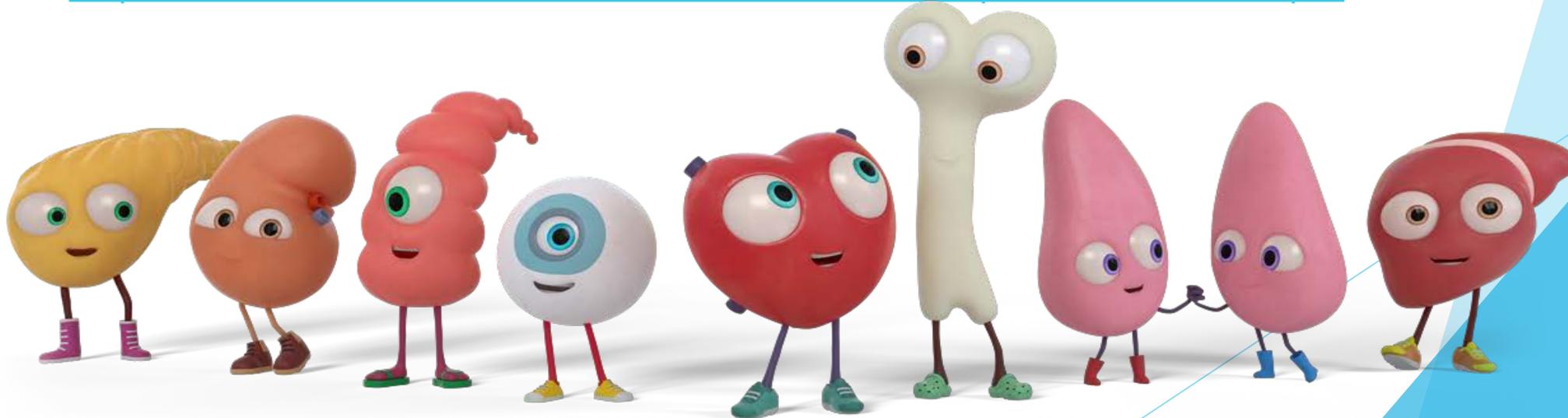
1. Have you lost weight in the past 6 months WITHOUT TRYING to lose this weight?

*If the patient reports a weight loss but gained it back, consider it as NO weight loss.

2. Have you been eating less than usual FOR MORE THAN A WEEK?

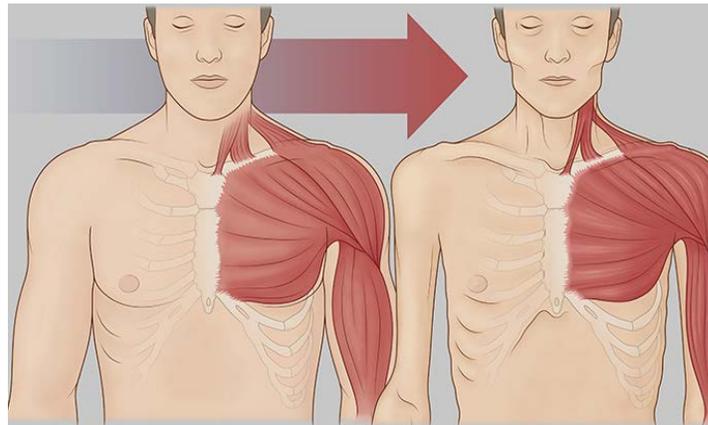
▶ Two "YES" answers indicate nutrition risk†

▶ <http://www.nutritioncareincanada.ca/sites/default/uploads/files/CNST.pdf>



Physical Assessment and Biochemistry

- ▶ Weight measures with all visits, extremely helpful
- ▶ Fat/Muscle wasting assessment (SGA)
- ▶ CBC
- ▶ Iron status (Ferritin)
- ▶ HgbA1C
- ▶ Glucose
- ▶ Vit D ** Only in presence of malabsorption, special req
- ▶ Lytes/Mg
- ▶ Serum protein markers
- ▶ Micronutrient panel: Vit A, E, C, B12, Folate, Selenium, zinc, copper
- ▶ Lipid Profile +/-





Serum Protein Markers

- ▶ Lacking a reliable lab indicator to identify malnutrition
 - ▶ Not specific, nor sensitive
- ▶ Many variables affect serum protein markers
 - ▶ i.e. inflammation... cancer! Also infection, surgery, autoimmune processes, etc
- ▶ Commonly used:
 - ▶ Albumin
 - ▶ Prealbumin



Albumin

- ▶ Very little of albumin pool is comprised of newly synthesized albumin, therefore protein intake very little effect on total albumin pool on a daily basis.
- ▶ Often affected by redistribution between extravascular and intravascular space (common with edema from certain cancers/chemo, problems with heart/liver/kidney, IVF, inactivity)
- ▶ Affected by capillary permeability, drugs, impaired liver function, inflammation, etc...
- ▶ May be falsely high in dehydration (decreased plasma volume).
- ▶ Negative acute phase reactant (levels decrease with acute phase response)
- ▶ Long half-life (14-20 days), therefore more a marker for chronic malnutrition
- ▶ Primary function is a carrier protein, maintains oncotic pressure (may be given via IV, although practice is controversial)

Table 1
Factors Affecting Serum Albumin Levels (73)

Increased in

Dehydration
Marasmus
Blood transfusions
Exogenous albumin

Decreased in

Overhydration/ascites/eclampsia
Hepatic failure
Inflammation/infection/metabolic stress
Nephrotic syndrome
Protein losing states
Burns
Trauma/post-operative states
Kwashiorkor
Collagen diseases
Cancer
Corticosteroid use
Bed rest
Zinc deficiency
Pregnancy

Used with permission from the University of Virginia Health System Nutrition Support Traineeship Syllabus



Prealbumin

- ▶ Like albumin, is a visceral protein
 - ▶ Affected by many of same factors as albumin
 - ▶ Negative acute phase reactant - assess with c-reactive protein
- ▶ Advantage: Shorter half-life (2-3 days), therefore changes more rapidly with acute changes in nutrient intake
- ▶ Elevated in AKI
- ▶ Unaffected by hydration status

Table 2
Factors Affecting Serum Prealbumin Levels (73)

Increased in

Severe renal failure
Corticosteroid use
Oral contraceptives

Decreased in

Post-surgery
Liver disease/hepatitis
Infection/stress/inflammation
Dialysis
Hyperthyroidism
Sudden demand for protein synthesis
Pregnancy
Significant hyperglycemia

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Other markers

- ▶ Transferrin (half-life: 8-10 days)
 - ▶ Influenced by iron status (deficiency increases transferrin)
- ▶ Retinol Binding Protein (RBP) (half-life: 12 hours)
 - ▶ Elevated in renal failure
 - ▶ Dependent on normal Vit A and Zn
- ▶ Nitrogen balance
 - ▶ Gold standard but also inconsistent, mainly for inpatients (with foley)
 - ▶ Nitrogen intake minus nitrogen loss from the body
 - ▶ Need 24 hour urine urea and total protein intake
 - ▶ Affected by kidney dysfunction and diuretics

Diabetes and Cancer



- ▶ Increased risk as other treatment can effect BBGM control; PET, anti-emetics (dexamethasone), chemotherapy, weight loss, stress...
- ▶ DM occurs commonly in pancreatic cancer pts, ~50% are at diagnosis
 - Recent onset of DM without family history or high body wt is a warning sign
- ▶ Type 3c DM, pancreatogenic diabetes, originates from pancreatic dx. lends to more “brittle diabetes”



Diabetes and Cancer



- ▶ Patients with active cancer, the focus of hyperglycemia management shifts from preventing long-term complications toward avoiding acute and sub-acute outcomes, such as dehydration from polyuria, infection, catabolic weight loss, hyperosmolar non-ketotic states (HNK), and diabetic ketoacidosis
- ▶ Studies found correlation between hyperglycemia and increase toxicities with systemic cancer treatments



Nutritional Requirements:



What We (dietitians) Recommend!

- ▶ Assess REE/caloric needs. Start 25-30kcal/kg/d
 - ▶ Decreased in >65y, Non-metastatic Breast/Prostate, brain as not high needs (21-25kcal/kg/d)
 - ▶ Increased with large tumour burden, esophageal, head and neck, lung, pancreatic, metastatic malignancies. (35-45kcal/kg/d)
- ▶ Pt are placed on high protein diet: 1.2-2g protein/kg of body weight/day. Normal person 0.8-1g/kg/d.
- ▶ We do no restrict fat, we encourage healthy fat consumption. Fat is calorie dense, helpful with poor appetite. 9kcal/g fat vs 4kcal/g CHO. Also does not raise blood sugars
- ▶ We absolutely recommend management of diabetes pre, during and post-treatment, balanced CHO intake, low glycemic index if possible
- ▶ We often suggest: Multivitamin, Vit D3, Fish oil, Iron or B12 (correction of anemia)

Nutrients to Highlight

- ▶ **Multivitamin**, If pt malnourished, poor intake, suggested, age appropriate 1/d
- ▶ **Vit D3**: Plays role in immune system, evidence showing increased apoptosis, decrease ability of tumour to form blood vessels, preserved & increased lean body mass, improved sarcopenia
- ▶ RCT 2017 showing high dose of vitamin D supplementation significantly improved progression-free survival (PFS) by about 2 months compared to a low dose. (Colorectal CA)
 - ▶ 31% reduced relative risk for disease progression in the high-dose group (unadjusted hazard ratio, 0.69; $P = .04$)
 - ▶ The disease control rate in the high-dose group was 96% vs 84% in the low-dose group ($P = .05$)
 - ▶ The high dose did not increase toxicity. There was also significantly less serious (grade 3 and 4) diarrhea in the high-dose group (12% vs 1%; $P = .02$).

Vitamin D Rich Foods



Nutrients to Highlight

Omega 3 Fatty Acid: DHA/EPA

- ▶ Source long-chain Omega 3 fatty acid suggestive to improve appetite, oral intake, lean body mass, body weight in pt with advanced cancer
- ▶ Promising evidence improved tumour response when taken during treatment
- ▶ Trend towards improved one-year survival
- ▶ 2g Fish oil/d



J.Arends et al./Clinical Nutrition 36(2017) 1187-1196

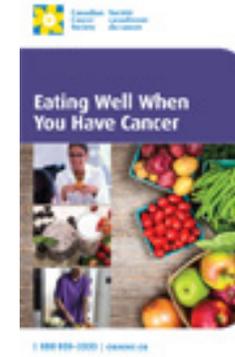


Special Considerations:



- ▶ Pancreatic cancer → Pancreatic Enzymes Insufficiency (PEI) requiring Pancreatic Enzyme Therapy (PET), Pt will malabsorb all macronutrients and fat soluble vitamins. Signs: bloating, foul gas, steatorrhea, diarrhea, pain w/ingestion, unexplained weight loss, hypoglycemia...
 - ▶ PET: Use enterically coated orally: Contain pancreatic lipase - amylase, lipase and protease (Cotazyme ECS, Creon). Start low and titrate.
 - ▶ Have been found to be useful post gastrectomy. Improve steatorrhea secondary to fast transit time.
- ▶ Discourage extreme supplementation or dietary changes.
 - ▶ High dose Vit C found to be detrimental for cancer pts, causing cancer cell to be protected as well as healthy cells
 - ▶ Evidence does not support removing meat and becoming vegan/vegetarian. Dietary restriction in choices could prove more dangerous
 - ▶ Consult Dietitian and rely on their expertise to navigate dietary changes

Resources for Patients



- ▶ Canadian Cancer Society: <https://www.cancer.ca/>
<http://www.cancer.ca/en/support-and-services/resources/publications/?region=on>
- ▶ National Cancer Institute: <https://www.cancer.gov/>
- ▶ American Cancer Society: <https://www.cancer.org/>
- ▶ Gastric Cancer: <https://www.nostomachforcancer.org/>
- ▶ Pancreatic Cancer: <https://www.pancan.org/>
- ▶ American Institute for Cancer Research: <http://www.aicr.org/>
- ▶ Breast Cancer: <http://www.breastcancer.org/>
- ▶ Lymphoma: <https://www.lymphoma.ca/>
- ▶ Prostate Cancer: <http://www.prostatecancer.ca/>

Questions

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