Medical nutritional therapy of atherosclerosis

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Medical Nutritional Therapy MNT

- The use of specific nutrition interventions to treat an illness, injury or condition.

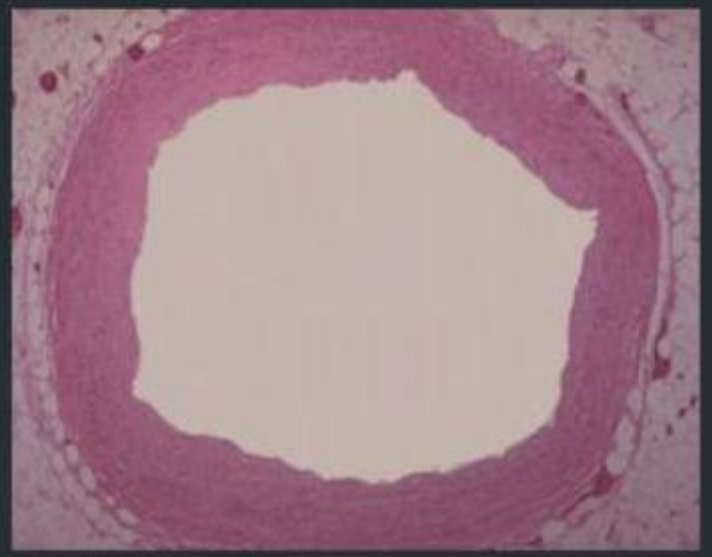
Nutrition Care Process

- Process of planning MNT
- 1.Assessing nutrition status.
- 2.Coming up with a nutrition diagnosis.
- 3.planning intervention(s).
- 4.Evaluating outcomes.

Atherosclerosis

- **Thickening or hardening of the arteries**.
- It is caused by a buildup of plaque in the inner lining of an artery.
- Plaque is made up of deposits of fatty substances, cholesterol, cellular waste products, calcium, and fibrin.
- As it builds up in the arteries, the artery walls become thickened and stiff.

ATHEROSCLEROTIC PLAQUE



NORMAL ARTERY

ATHEROSCLEROTIC PLAQUE

FORMS OF ATHEROSCLEROSIS

- CEREBRAL ARTERIES INJURY
- CARDIAC ARTERIES INJURY
- RENAL ARTERIES INJURY
- AORTA INJURY
- INTESTINAL ARTERIES INJURY
- EXTREMITY ARTERIES INJURY

What Causes It?

Many researchers believe it begins with an injury to the innermost layer of the artery, known as the endothelium. These factors are thought to contribute to the damage:

- High blood pressure
- Elevated LDL ("bad") cholesterol
- An accumulation of homocysteine (an amino acid produced by the human body, thought to be a risk factor for heart disease, stroke, osteoporosis, diabetes, and dementia)
- Smoking
- Diabetes
- Inflammation

Once the artery is damaged, blood cells called platelets build up there to try and heal the injury. Over time, fats, cholesterol, and other substances also build up at the site, which thickens and hardens the artery wall. The blood flow through the artery is decreased, and the oxygen supply to organs also decreases. Blood clots may form, blocking the artery or entering your bloodstream and cut off blood supply to other organs.

Expected Duration

Atherosclerosis is a long-term condition that continues to worsen over many decades without changes in lifestyle and medication if neccessary.

RISK FACTORS FOR HEART DISEAS

MODIFIABLE RISK FACTORS:

-Smoking

-Obesity

-High Cholesterol

-Hypertension

-Diabetes

-Inactivity

NON-MODIFIABLE RISK FACTORS:

- Age

-Genetics

-Gender

Functions of the Plasma Lipoproteins

- Chylomicron—Transport of dietary triglyceride
- VLDL—Transport of endogenous triglyceride
- IDL—LDL precursor
- LDL—Major cholesterol transport lipoprotein
- HDL—Reverse cholesterol transport

LDL and HDL Cholesterol Laboratory Values Predict Risk of CHD

- LDL-C >130 mg/dl
- HDL-C <35 mg/dl
- Total cholesterol (TC) >200 mg/dl
- Total triglycerides (TG) >150 mg/dl
- Formula: LDL-C = TC – HDL-C–(TG/5)

HOW DO WE EXPLAIN CHOLESTEROL?

- Cholesterol travels in the blood in packages called "lipoproteins" → (a package of "fat" wrapped with protein)
- LDL = "Lousy" / sticky cholesterol
  - equate with greasy build up in kitchen plumbing
- HDL = "Healthy" cholesterol
  - "arterial Drano"

HDL Cholesterol Levels Predict Risk of Coronary Heart Disease

- **Increased by:**
- Exercise
- Weight loss
- Moderation of alcohol
- **Decreased by:**
- Obesity
- No exercise
- Cigarettes
- Androgenic steroids
- B blockers
- High TGs
- Genetic factors

LDL Cholesterol Levels Predict Risk of Coronary Heart Disease

- **Increased by**
- Fat in diet
- Obesity
- Diabetes
- Hypothyroidism
- **Decreased by**
- Estrogen

General Goals for Treatment of Hyperlipidemias

- Achieve IBW.
- Decrease simple sugars and alcohol.
- Decrease total fat, especially cholesterol and SFA.
- Increase complex carbohydrate and fiber.

Lipid-Lowering Drugs Added if Diets Are Not Successful

- After a 6-month trial on each diet, drugs are added to the treatment.
- Types:
- Nicotinic acid and lovastatin
- Gemfibrozil, probucol, clofibrate— for high TGs
- Cholestyramine and colestipol (bile acid sequestrants)—to lower high cholesterol; may increase TGs

LDL GOALS

- Low risk (0 – 1) risk factors < 160 mg/dL
- Moderate risk (2+) risk factors < 130 mg/dL
- Presence of Cardiovascular disease < 100 mg/dL
- High risk (DM, etc.)<70 mg/dL

- All adults >20 yr should know their number
  - Fast for 12 hrs

Supporting Dietary Evidence

- In primates, hyperlipidemia and CAD can be consistently induced by diets high in saturated fats
- Seven Countries Study showed that individuals and populations whose diets are rich in saturated fat have a significantly greater incidence of CAD than those who eat diets low in saturated fat
- Regression analysis has shown that for every 1% decrease in energy consumed as saturated fatty acids, LDL-C is decreased by 1.93 mg/dL

HEART HEALTHY TIP#1

- Go easy on dietary fat, especially saturated and trans fats
  - AHA Guidelines: (Therapeutic Lifestyle Changes Diet or TLC Diet)

	Prevention	CAD Present
Total fat	≤30%	≤25%
Saturated fat and		
Trans fats	≤10%	≤ 7%
MUFA	10%	≥13%
Cholesterol	<300mg	<200 mg.

Fats101: The Good, The Bad, and The Ugly

☎ The Good = Monounsaturated
Polyunsaturated

⌨ The Bad = Saturated

⌨ The Ugly = “Trans” or Hydrogenated

Polyunsaturated Fats

- Sources: Vegetable oils such as corn, safflower, sunflower and soybean oils
- Liquid at room temperature and when refrigerated
- Effects: ↓ LDL and ↓ HDL

Monounsaturated Fats

- Sources: Olive, canola, peanut oils and avocados
- Liquid at room temperature; semi-solid when refrigerated
- Effects: ↓ LDL Neutral or ↑ HDL

Saturated Fats

- Sources: Primarily in animal products (whole milk, cheese, meats, cream, butte
- Plant sources: coconut & palm oil, cocoa butter
- Solid at room temperature
- Effect: Dramatically ↑ LDL, slight ↑ HDL
- Exception: stearic acid, found in cocoa butter and animal fat has a neutral effect on blood cholesterol

Trans Fats – Hydrogenated

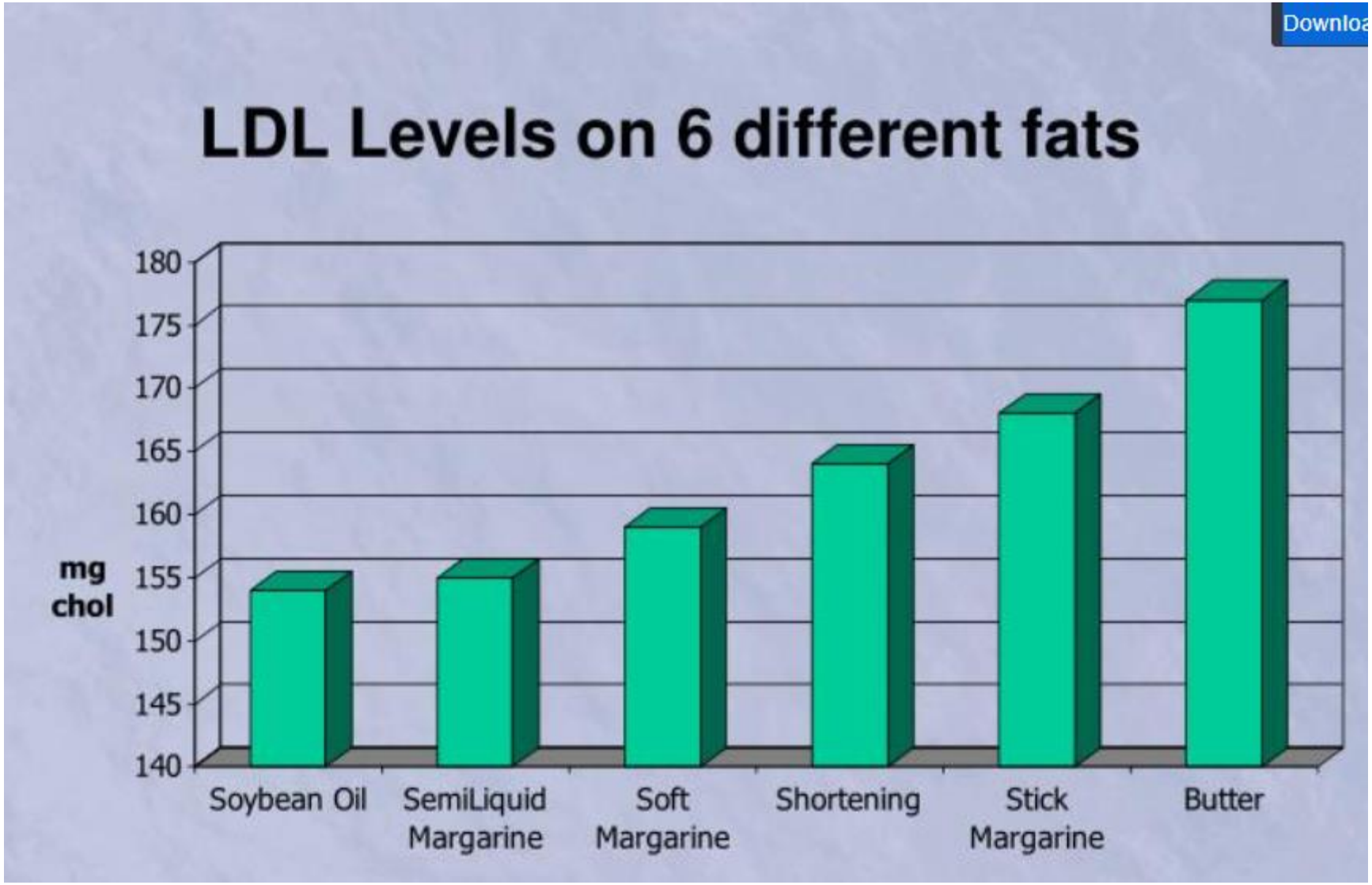
- Occur naturally in **small** quantities in meat and dairy fat
- Majority is consumed in commercial foods (80%)
- Formed when liquid oils are heated in presence of H+
- More hydrogenation = more solid fat

Effects of Trans-Fatty Acid Intake

- The Nurses' Health Study found that replacing only 30 calories of carbohydrate with 30 calories of trans fats nearly doubled risk of coronary artery disease*
- Effect: ↑ Total Cholesterol
  - ↑ LDL-C
  - (-) or ↓ HDL-C
  - ↑ the TC/HDL-C-ratio in a dose dependent manner

WHAT'S BETTER:

Butter or Margarine????


LDL Levels on 6 different fats
mg chol
180
175
170
165
160
155
150
145
140
Soybean Oil
SemiLiquid Margarine
Soft Margarine
Shortening
Stick Margarine
Butter

ADA Recommendations

- Trans-fatty acid consumption should be as low as possible (0-2 grams/day)
- Limit the COMBINED intake of saturated fat AND trans fat to <7% of total calorie intake

Trans fats in Food

- KFC Chicken Pot Pie: 14 g.
- McDonald's large fries: 8 g.
- Burger King's large fries: 7 g.
- McDonald's 10-pc. Chicken strips: 9 g.
- Dunkin Donut: 5 g.

***ADA recommends 0-2 g. trans fats/day

What About Dietary Cholesterol?

- Average person synthesizes 75% of blood cholesterol in liver (1000 **mg/day**); only 25% derived from dietary cholesterol = only slight impact.
- Nurses' Health Study (Harvard) of 80,000 RNs found that increasing cholesterol intake by 200 **mg/day** (1 egg yolk) did not appreciably increase risk of CAD. (Exception: diabetes mellitus or positive family history).
- AHA recommends limiting dietary cholesterol to $\leq$200 **mg/day.**
- The largest influence on blood cholesterol is the type of fats in diet.

Heart Healthy Tip #2:

Go for the Fiber!!!

DIETARY FIBER

- Oatmeal, Oat Bran and Barley
  - Beta Glucan and pectin (Soluble fibers)
  - Lowers LDL by 10% -16%
  - Other Sources of Soluble Fiber
    - Fruits (5+ servings/day) especially apples, grapes,
    - citrus, strawberries
    - Legumes
    - Psyllium (2 ounces/day) decrease LDL by 16% in three months

Note: For every 1-2 g, soluble fiber may lower LDL-C by 1%

Heart Healthy Tip #3

- Try Plant Stanol or Sterols

PLANT STANOLS AND STEROLS

- Sources: Naturally present in soy and corn; must be esterified to increase solubility
- Block cholesterol absorption in gut
- Lowers LDL-C by 8-15% and TC by 3.5-10.3%
- Does not change HDL-C or triglyceride concentrations
- AHA recommendation: Include 2-3 g/day of plant stanols/sterols

Heart Healthy Tip #4:

❤Go NUTS!!!!

- **Nuts – Walnuts**
  - 6 year follow-up study found that a diet incorporating 20% of calories from walnuts reduced total cholesterol by 12% more than subjects on American Heart Association TLC Diet
  - Decreased LDL by 16% more

Sabate J, et al. NEJM 328:603,1993

Nuts

- The Nurses Health Study found that women who ate > 5 ounces of nuts per week had reduced risk of coronary artery disease events!
- Because of their beneficial fatty acid profile, nuts may be isocalorically incorporated into a cardioprotective pattern low in saturated fat to reduce TC by 4-12% and LDL-C by 6-29%
- ½ cup nuts > 400 calories!

Heart Healthy Tip #5:

♥Go Fishin'!!!!

Fatty Fish and Flaxseed

- Contain Omega-3 Fatty Acids
- Benefits include
  - Decreased risk of arrhythmias, which can lead to sudden cardiac death
  - Decreased triglyceride levels (very effective)
  - Decreased platelet aggregation
  - May decrease blood pressure

Omega-3 Fatty Acids Sources

- Fish Sources
  - EPA (eicosapentaenoic acid)
  - DHA (docosahexaenoic acid)
  - Best sources: salmon, lake trout, albacore tuna, mackeral, herring, sardines
- Plant Sources
  - Linolenic acid (needs conversion, modest effect)
  - Good sources: flaxseed, canola oil, soybeans, walnuts (and their oils)

Fatty Fish and Omega-3 Fatty Acids

AHA Recommendations

- Eat fish (particularly fatty fish high in Omega-3 fatty acids) at least two times each week for prevention of heart disease
- Patients with documented coronary heart disease: 1 gram of EPA + DHA per day
- Patients with hypertriglyceridemia: 2-4 grams of EPA + DHA per day

Sources of Omega-3 Fatty Acids (per 3 ounce serving)

DHA/EPA	(g)	LNA	(g)
Mackeral	4.5	Flaxseed	19
Herring	2.6	Walnuts	5
Salmon	1.6	Soybeans	3
Albacore Tuna	1.3	Wheat germ	0.6
Trout	1.3	Almonds	0.3
Omega Eggs (2)	0.7		
Canned Tuna	0.2		

Heart Healthy Tip #6:

❤ Aim for a Healthy Weight!

Effects Of Weight Reduction

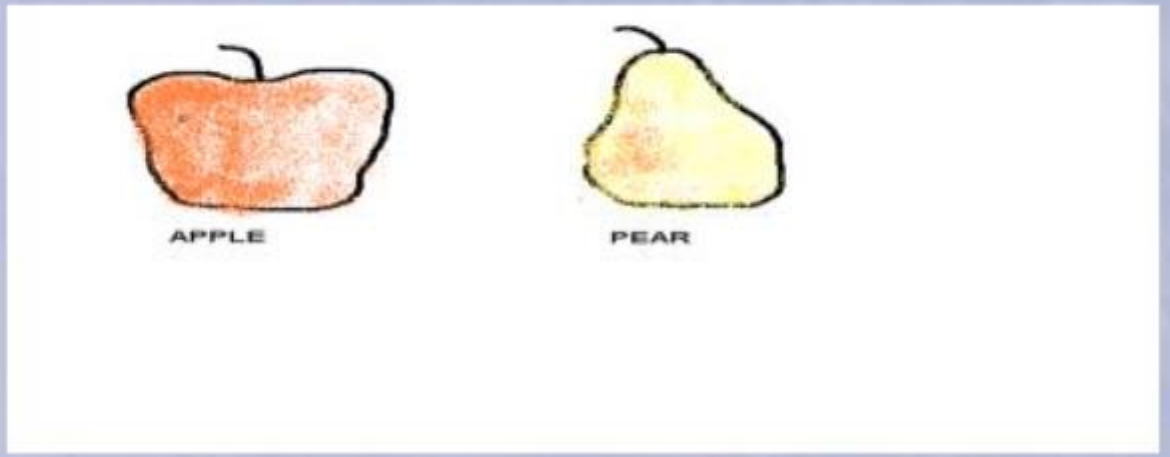
- For every 5 lbs lost …
  - Total cholesterol drops by 7 points
  - LDL drops by 3 points
  - Triglycerides drop by 14 points
  - HDL raises by 1 point

GOAL: **BMI < 25 or a loss of 10% current body weight**

Achieving A Healthy Weight

- How many calories?
  - Female: current weight * 10
  - Male: current weight * 11
- Goals
  - 1-2 lbs of weight loss/week
  - 10% of current weight in 6 months or 10 lbs
  - A deficit of 500 calories/day = 1 lb body fat/week

The Apple vs. The Pear



- Apple shape increases risk of heart disease as compared with pear shape
- Waist circumference goals
  - Men <40 inches
  - Women <35 inches

HEART HEALTHY TIP #6

Sweat It!!!!!

- National Institute of Health recommends an accumulation of 30 minutes per day.
- Increase gradually
- May break up into sessions
  - Use stairs instead of the elevator
  - Park further away at work or the mall
  - Ride a bike
  - Take a walk at your break
  - Pair up and exercise with a friend

What about taking Vitamin supplements, such as Vitamins E or C????

Antioxidants: Vitamins E, C and Beta-Carotene

- AHA and ADA Recommendations
  - These supplements have shown no protective benefit for CVD events, or all cause mortality nor was there an effect on lipids. (ranges from 200 to 1200 IU/day)
  - AHA Science Advisory reported that Vitamin E supplementation was associated with death from hemorrhagic stroke.
  - Supplements of these anti-oxidants should not be recommended to reduce the risk of CVD
  - The general population should focus on consuming a balanced diet with emphasis on antioxidant rich fruits, vegetables and whole grains.

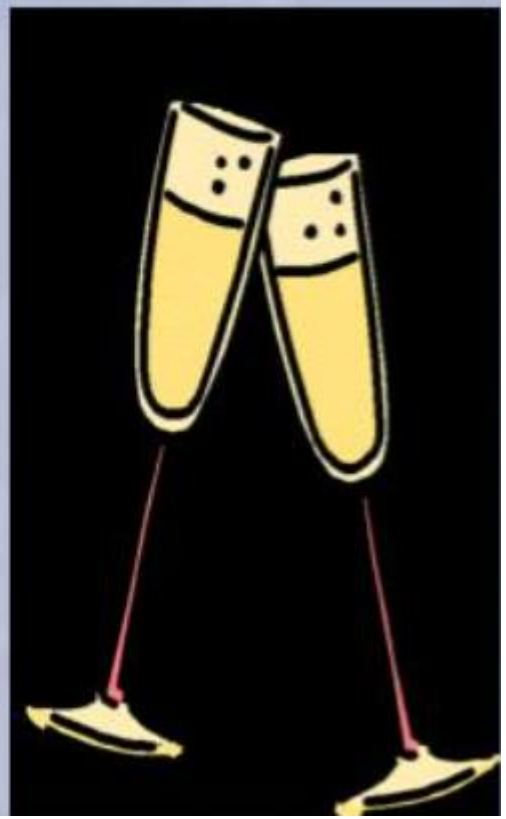
To Toast or Not To Toast . . .

- French Paradox Study: Regular use of red wine = low rate of heart disease

To Toast or Not To Toast . . .

Effects

- May increase HDL
- May increase blood pressure
- May increase triglycerides
- Significant source of calories



AHA and ADA's Recommendation Regarding Alcohol Intake

- Current evidence does NOT justify encouraging those who do not drink to do so
- If a patient currently consumes alcohol, then moderate use is recommended
  - 2 drinks or less per day for males
  - 1 drink per day for females
- There is no evidence that one type of alcohol is best

Strategies to Reduce LDL

• Moderate weight loss	• Lowers LDL 5%
• Addition of soluble fiber, nuts and soy	• Lowers LDL 5-10%
• Addition of 2 g. stanols/sterols	• Lowere LDL 10%
• Restriction of Sat. and trans fats	• Lowers LDL 10%
• Statin drugs	• Lowers LDL 20-50%

Strategies to Lower Triglycerides

- Moderate weight loss
- Fish oils (2-3 grams/day)
- Limit alcohol
- Limit carbohydrates, especially refined (sugary) carbs, (Carbs<=45% total calories)

Myocardial Infarction (MI) Coronary Infarction, Coronary Thrombosis, or Heart Attack

- Some part of coronary circulation blocked
- Ischemia leads to muscle destruction
- Diagnosis: ECG; blood levels of enzymes such as LDH and CPK

Myocardial Infarction—MI

- Postinfarction nutrition
- 1. 1st 24 hrs: no caffeine, liquid diet(nausea and choking are common)
- 2. Small frequent meals; soft or liquid diet
- 3. Na+ restriction if BP and fluid status indicate
- 4. Consistent diet information
- 5. Drugs that cause nausea—digitalis, morphine