MUNI
PHARM

GASTROINTESTINAL SYSTEM DISEASES MALNUTRITION, DEHYDRATION

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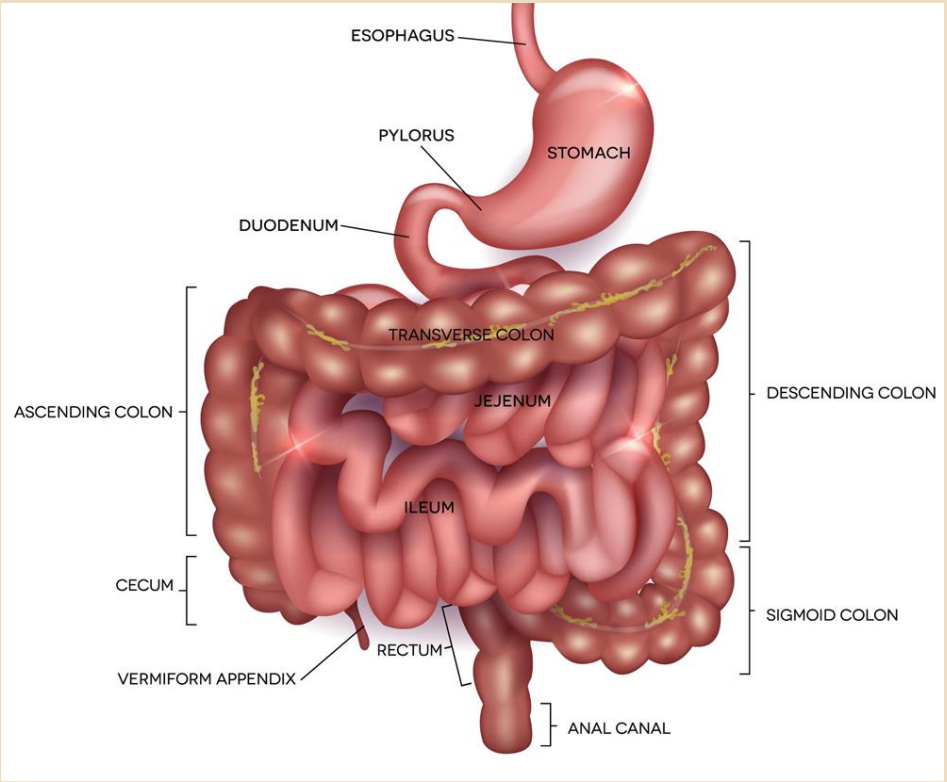
Lecture from Geriatric Pharmacotherapy 24.3. 2023

GIT changes in old age

- **motility**
  - swallowing disorders
  - decrease of esophageus relaxation
- **enzyme and hormone secretion**
  - poor digestion and absorption of nutrients



Oral cavity

Xerostomia

- **dry mouth**
- one of the most common oral sensory complaints in elderly
- associated with age-related alteration in saliva composition
- medication side effect
  - TCA, atropine, antiparkinsonian drugs
- damage to salivary glands following radiation for head and neck cancer

Dysgeusia/ageusia

- **taste disturbances/total loss**
- medication side effect
  - lithium, levodopa, glipizide

Oral cavity

Oropharyngeal dysphagia

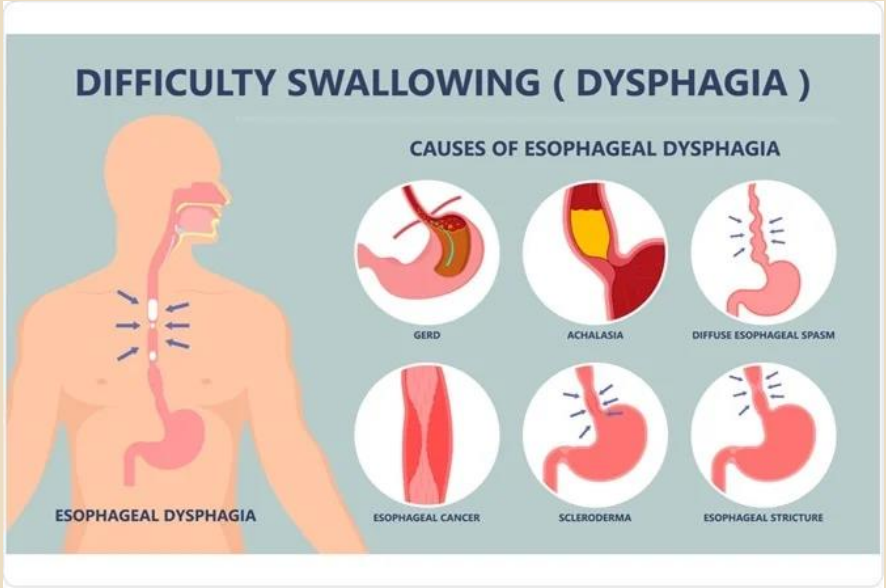
- sensation of difficulty chewing food or initiation of swallowing
- results from poor coordination of neuromuscular activity in the tongue, pharynx and esophagus
- common in elderly secondary to stroke, multiple sclerosis, dementia, Parkinson´s disease

- **symptoms:** cough with swallowing, nasal regurgitation
  - risk of aspiration, pneumonia or asphyxia
- **therapy:** learning swallowing techniques

Esophagus

Esophageal dysphagia

- feeling of food being stuck in the chest
- **causes:**
  - mechanical (tumor)
  - neuromuscular (achalasia)
  - inflammatory (esophagitis)
- **diagnosis:**
  - clinical signs
  - endoscopy
- **therapy:**
  - esophageal dilation
  - surgery
  - antacids



https://www.news-medical.net/health/What-is-Dysphagia.aspx

Esophagus

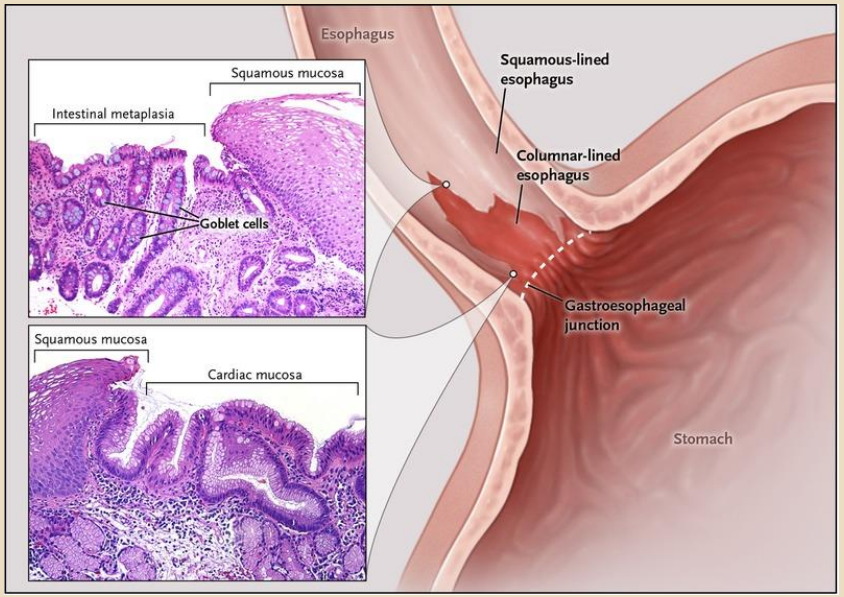
Gastroesophageal reflux disease (GERD)

- reflux of stomach contents
- high prevalence among elderly (over 20 %)
- **symptoms:** odynophagia and dysphagia, rather than heartburn
- **therapy:**
  - **antacids, proton pump inhibitors (PPI)**
  - laparoscopic anti-reflux surgery
  - **PPI** side effects should be kept in mind
    - risk of osteoporosis, development of *Clostridium difficile* colitis, interstitial nephritis
      - lifelong PPI therapy should be avoided

Esophagus

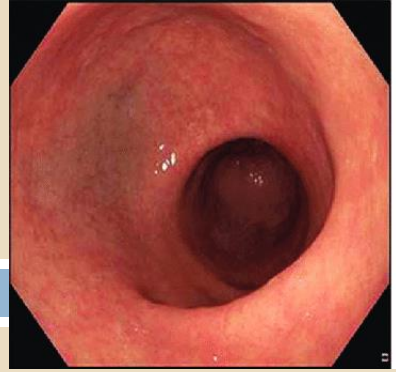
Barrett´s columnar-lined esophagus (CLE)

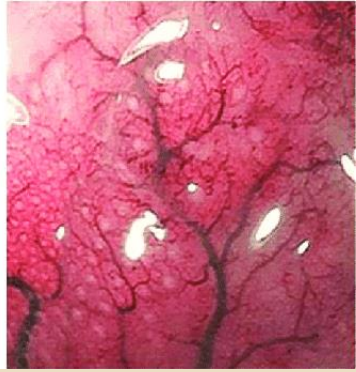
- replacement of the normal distal esophageal squamous epithelium by metaplastic columnar epithelium
- result of prolonged reflux
- increased age as a risk factor for high grade dyplasia and development of **adenocarcinoma**



The New England Journal of Medicine: Barrett´s Esophagus

Stomach

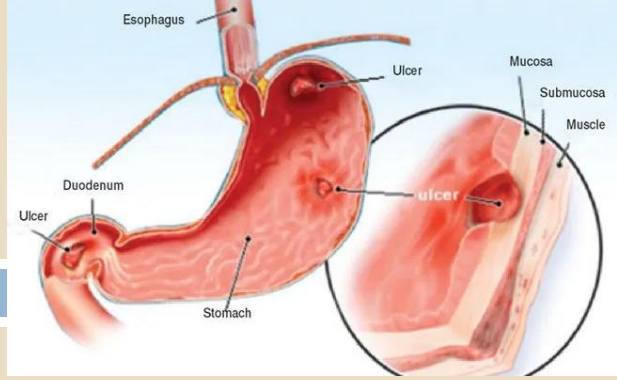




Chronic atrophic gastritis (CAG)

- more prevalent in elderly
- loss of glands in the mucosa leading to **hypochlorhydria/achlorhydria** and lack of **intrinsic factor**
  - changes in human gastric microbiota associated with increased risk for gastric cancer
  - decreased calcium absorption secondary to achlorhydria and decreased bone mineral density
  - vitamin B_{12} malabsorption, gastric bacterial overgrowth, intestinal infections

Stomach



Peptic ulcer disease

- gastric and duodenal injury leading to a break in mucosa
- mortality higher than in younger groups
- age-related physiological changes
  - reduced gastric blood flow and decreased production of bicarbonates and mucin prostaglandins
- *Helicobacter pylori* infection
- NSAIDs
- clinical manifestation usually atypical (without pain)
- **therapy:** proton pump inhibitors (PPIs), histamine receptor antagonists (H2 blockers), ATBs (amoxicillin, clarithromycin), antacids

Small intestine

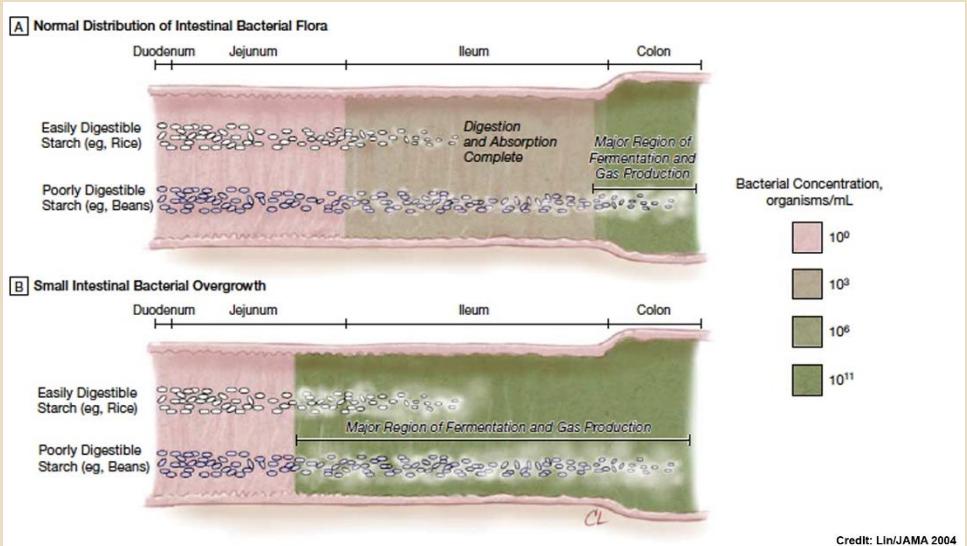
Celiac disease (CD)

- systemic autoimmune diseases with sensitivity to gluten and its protein gliadin
- tissue transglutaminase binds to gliadin and specific antibodies are produced
- **malabsorption syndrome** with chronic diarrhea, mineral deficiencies, weight loss
- calcium and vitamin D deficiency
- neurologic manifestations
  - dementia, neuropathy
- **therapy:** gluten-free diet

Small intestine

Small intestinal bacterial overgrowth (SIBO)

- excessive presence of bacteria in the small intestine
- higher prevalence in elderly mainly due to achlorhydria and small bowel dysmotility
  - chronic diarrhea, malabsorption, weight loss, bloating
- **therapy:** dietary changes (low carbohydrate diet), prokinetic agents increasing GIT motility, ATB, probiotics



Large intestine

Constipation

- decrease in defecation frequency to 3 or fewer per week
- caused by decreased mobility, cognitive impairment, co-morbidities (Parkinson´s disease, stroke, hypothyroidism, depression) and polypragmasia
  - opioids, anticholinergics, NSAIDs, Ca channel blockers
- **complications:** stool impaction leading to ulcers and colonic perforation
- **prevention:** high fiber diet, physical activity
- **therapy:** laxatives (lactulose, psyllium)

Large intestine

Diarrhoea and incontinence

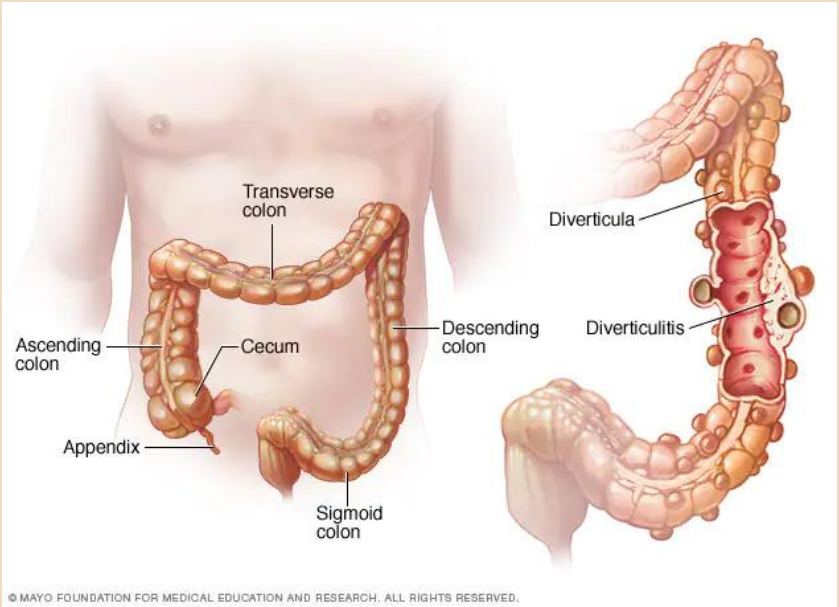
- infectious agents
- diabetes mellitus
- drugs, thyreotoxicosis
- diverticulosis/diverticulitis
- colorectal carcinoma

- **therapy:**
  - high-fiber diet
  - antidiarrhoic drugs (loperamide, diphenoxylate)

Large intestine

Diverticular disease (diverticulosis/diverticulitis)

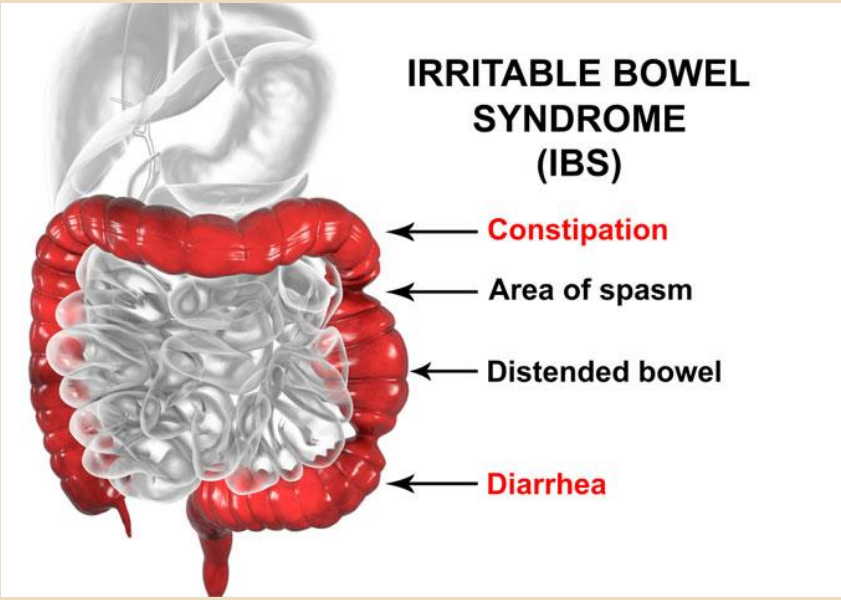
- presence of **diverticula**
  - sac like outpouchings of mucosa of colon because fo increased intraluminal pressure
- the most common complication is inflammation of diverticula – diverticulitis
- bleeding, perforation, abscess formation
- **therapy:**
  - high-fiber diet
  - surgery



Large intestine

Irritable bowel syndrome

- abdominal pain and alteration in bowel movements in the absence of any organic pathology
  - **diarrhea** predominant
  - **constipation** predominant
  - **mixed** bowel habits
- **therapy:**
  - stress and daily routine management
  - antispasmodics
  - antidepressants (TCA, SSRI)



Large intestine

Clostridium difficile colitis

- dysregulation of gut microbiota because of use of ATB
- **toxins A and B** damage colon epithelium and form typical inflammation with pseudomembranes
- diarrhea, kidney failure, sepsis
- **imunosenescence** – age-related change in the immune system and high susceptibility to infections

- **therapy:**
  - metronidazole, vancomycin, i.v. rehydration
  - surgery in severe cases

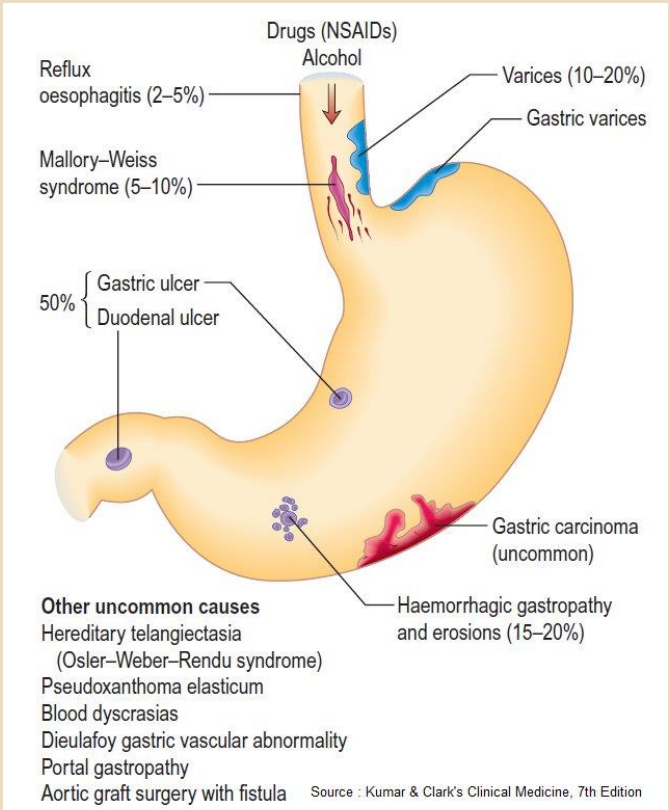
Large intestine

Inflammatory bowel diseases (IBD)

- **Crohn´s disease**
- **ulcerative colitis**
- abnormal immune response to gut antigens
- 15 % developed after 65y
- intestinal bleeding, diarrhea, abdominal pain, weight loss
- **therapy:**
  - aminosalicylates (mesalazine)
  - corticosteroids
  - immunosupressants (azathioprine, cyclosporine, methotrexate)
  - tumor necrosis factor-α (TNF-α) inhibitors (infliximab, adalimumab), α-4 integrin antagonist (natalizumab)

GIT bleeding

- **peptic ulcer** most common
  - gastroduodenal ulcers – 40-50% GIT bleeding
- **NSAIDs**
- **GIT inflammations**
- **esophageal varices**
- **tumors**
- **vessel malformations**
- **hemorrhoids**



Causes of upper gastrointestinal bleeding

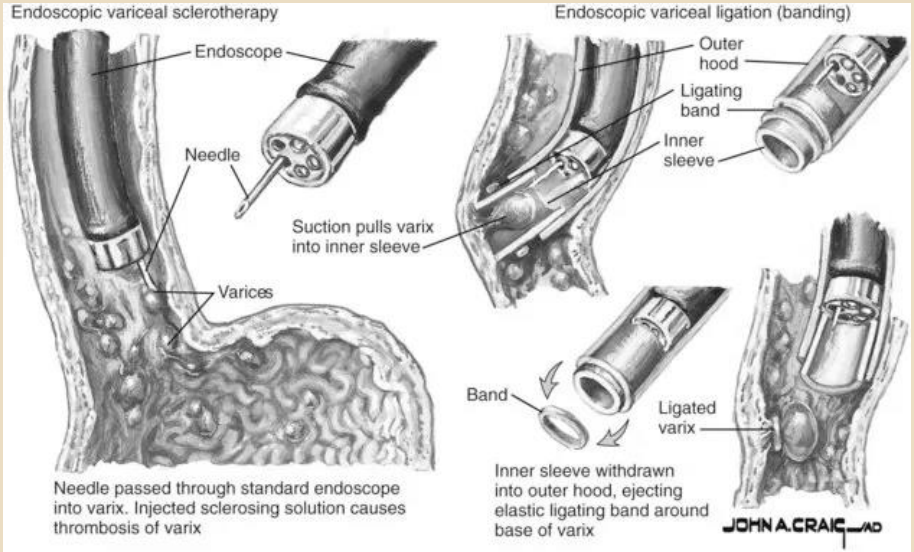
Clinical signs and diagnosis

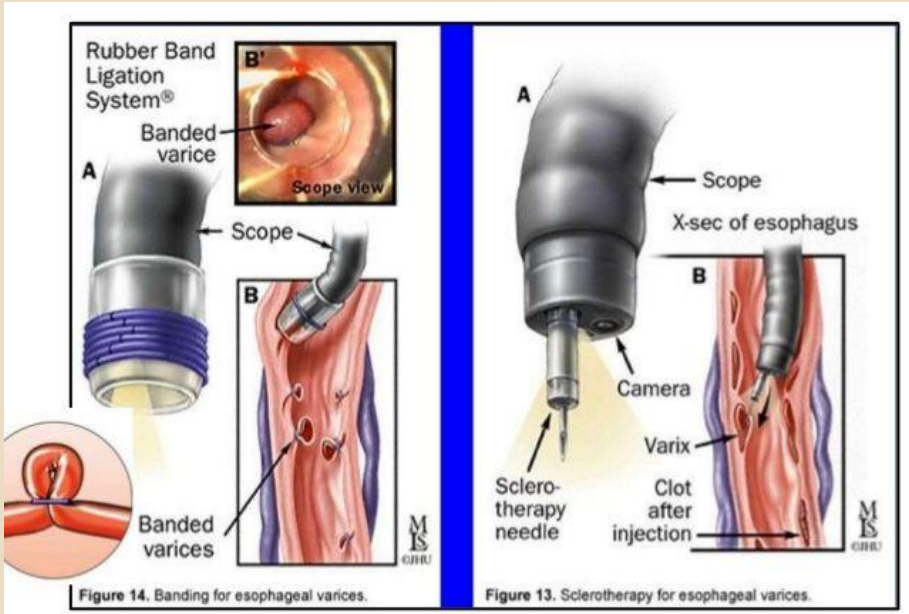
- **hematemesis** – vomiting of blood
- **melena** – the passage of black, tarry stools
- **hematochezia** – the passage of fresh blood per anus, usually in or with stools
- signs of **anemia**

- differences in comparison to younger patients
- many symptoms distorted by cognitive troubles
- surgical procedures often complicated by pneumonia, emboly, heart or renal insufficiency
- **diagnosis:** endoscopy
- **therapy:** sclerotization, thermocoagulation, clips, laser

Therapy of GIT bleeding

- **endoscopic hemostasis**
  - sclerotization, thermocoagulation, clips, laser
- **application of vasopressin analogues**
  - **terlipressin, ornipressin**





Dehydration

- **age-related causes**
  - fear to drink much
  - reduced mobility
  - decreases of sensitivity to thirst
- **iatrogenic causes**
  - drug intoxication and interactions
  - dyspepsia
- **psychological causes**
  - depression – concentration disorders, chronic complaints, loss of interest and hobbies
  - anxiety

Fluid balance

- adult – **2000-2500 ml water intake**
- 1500 ml recieved by mouth, the rest by the oxidation of nutrients
- **losses** – by kidney, lungs, skin and GIT

- **liquid need in acute conditions is increased:**
  - temperature increase by 1°C:100–300 ml
  - medium sweating: 500 ml
  - severe sweating and fever: 1000–1500 ml
  - hyperventilation: 500 ml
  - open wounds: 500–3000 ml

Types of dehydration

	Isotonic (isonatremic)	Hypertonic (hypernatremic)	Hypotonic (hyponatremic)
Loses	H_2O = Na	H_2O > Na	H_2O < Na
Plasma osmolality	Normal	Increase	Decrease
Serum Na	Normal	Increase	Decrease
ECV ICV	Decrease maintained	Decrease Decrease +++	Decrease +++ Increase
Thirst	++	+++	+/-
Skin turgor	++	Not lost	+++
Mental state	Irritable/lethargic	Very irritable	Lethargy/coma
shock	In severe cases	Uncommon	Common

Dehydration consequences

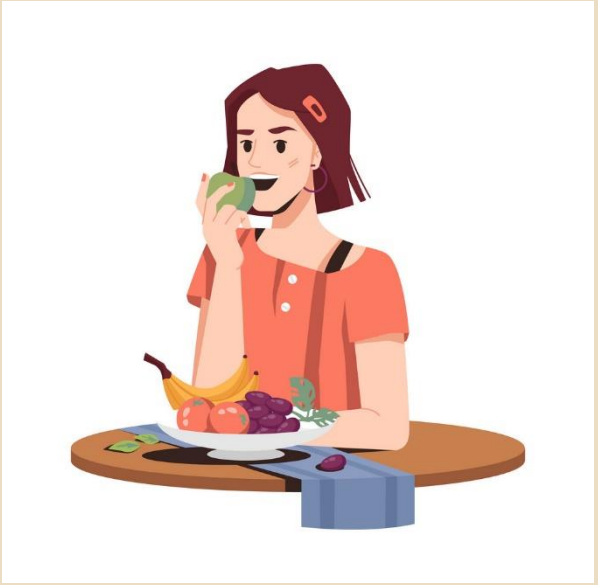
- **urological**
  - urinary system infections, lithiasis
- **gastrointestinal**
  - chronic obstipation, ileus, dyspeptic disorders (drug intoxications)
- **CNS disorders**
  - strokes, decompensated atherosclerosis, dementia
- **locomotory system**
  - loss of mobility, osteoarthritis and osteoporosis worsening from inactivity

Malnutrition

- nutrition disorder caused by inadequate or insufficient intake of basic energy substrates due to the need of the organism
- **causes:**
  - teeth defects
  - salivary glands disorders
  - oral cavity, esophagus, liver diseases
  - psychical disorders (depression, anxiety, dementia)
  - poor locomotory activity
  - taste of sense lowering

Frequent problems during food intake

- patient does not feel the food in the mouth
- bites badly
- keeps the food in the mouth
- forgets to swallow
- has a cough, blows into the food
- swallows badly
- suffers from common bronchitis because of aspiration



Malnutrition

- **protein-energy malnutrition (cachexia)**
  - gradual loss of fat and non-fat mass, weight loss BMI
  - normal plasma protein levels and starvation regulatory mechanisms are maintained
  - cause is balanced lack of food
- **protein malnutrition (kwashiorkor like)**
  - decrease in plasma albumin and transferrin levels
  - significant weight loss (edema), decrease in absolute lymphocyte count and cellular immunity
  - lack of proteins in food

Nutrition state examination

- **anthropometric, biochemical, immunological examination**
- **anamnestic examination**
  - lowering of body weight more than 20 % in last 2 month, more than 10 % in last 1 month
- changes in secretion of plasmatic proteins
  - **albumin** 35-45 g/l
  - **prealbumin** – acute protein malnutrition 0,15–0,4 g/l
  - **transferrin** 2-4 g/l, suitable together with **CRP**
    - increase in CRP with decrease of transferrin means a sign of malnutrition

Adaptation to starvation

- **gluconeogenesis** – glucose increase from glucogenic aminoacids and glycerol in liver
- increase in glucagon, cortisol and catecholamines production
- **lipolysis** in fatty tissue
- **gluconeogenesis** in liver
- **proteolysis** in skeletal muscles
- lowering of physical activity
- lowering of energetic output

Secondary effects of starvation

Impairment of:

- **immune system**
  - cellular component first (lymphocyte decreases), then humoral (immunoglobulins decrease)
- **wound healing and regenerative processes**
  - decrease of amino acids release for tissue regeneration
- **cardiovascular system**
  - heart muscle atrophy, loss of K, P, Mg – risk for arrhytmias
- **respiratory system**
  - respiratory muscles weakness (hypoventilation), pneumonias
- **thermoregulation**
  - basal metabolism, T3 and body temperature decrease

Secondary effects of starvation

Impairment of:

- **GIT**
  - intestinal atrophy (loss of nutrients, diarrhea)
  - decreased functions of pancreas
- **renal**
  - potassium depletion, tubular functions disorders
  - decreased sodium resorption – hypovolemia, shock
- **hematopoiesis**
  - vitamin insufficiency (B_6, B_{12}, folic acid) and trace elements (Cu, Fe)
  - sideropenic, megaloblastic anemia, pancytopenia
- **skeleton**
  - osteoporosis
  - vitamin D deficiency

Malnutrition and physical frailty

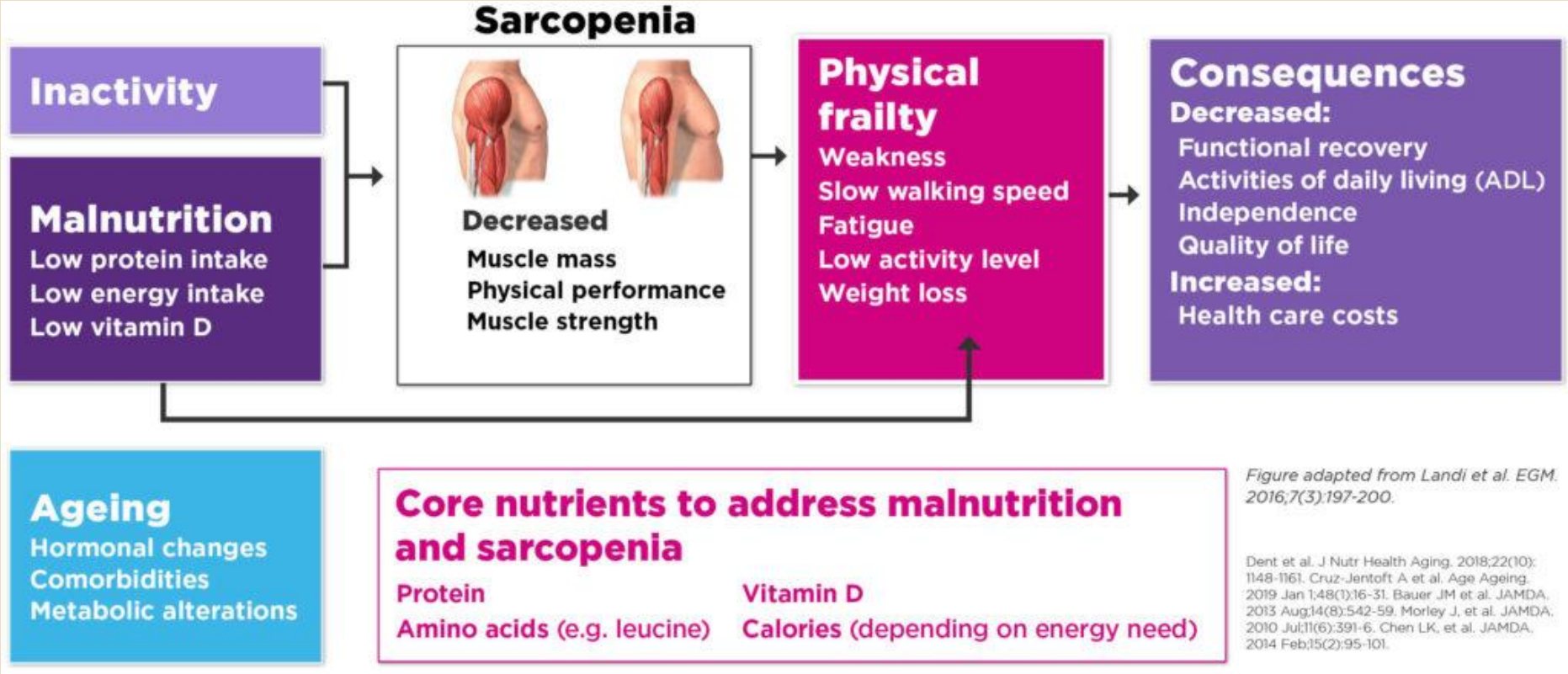


Figure adapted from Landi et al. EGM. 2016;7(3):197-200.

Dent et al. J Nutr Health Aging. 2018;22(10):1148-1161. Cruz-Jentoft A et al. Age Ageing. 2019 Jan 1;48(1):16-31. Bauer JM et al. JAMDA. 2013 Aug;14(8):542-59. Morley J, et al. JAMDA. 2010 Jul;11(6):391-6. Chen LK, et al. JAMDA. 2014 Feb;15(2):95-101.