Supportive Care in Cancer

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Supportive care in oncology

- Antiemesis
- Treatment of cancer pain
- Management of hematological toxicity
- Infectious complications
- Metabolic complications
- Nutrition support
- Psychosocial support

Antiemesis

Chemotherapy Induced Nausea and Vomiting
CINV

Types of CINV

CINV type	Description
Acute	0-24 h
Delayed	25-120 h (Day 2-5)
Anticipated	prior further chemo cycle
Breakthrough	despite prophylaxis
Refractory	not responding to treatment

Risk factors for CINV

Cytotoxic agents	Patient-based factors
Emetogenic drug	Young age < 50 yr
Higher dose of the drug	Female gender
Combination of drugs	History of vomiting
	CINV after prior chemo cycle
	Anxiosity
	Alcohol abstinence

Classification of cytotoxic drug emetogenicity

Classes of emetogenicity	Probability of CINV without prophylaxis
High	> 90 %
Moderate	30-90 %
Low	10-30 %
Minimal	< 10 %

Generaly emetogenic means the risk of CINV > 30 %

Antiemetic drugs

Class	Generic names	Half life *hours*
$5HT_3R$ inhibitors	ondansetron granisetron palonosetron	3 9 40
NK_1R inhibitors	aprepitant netupitant rolapitant	9 96 120
Corticosteroids	dexametasone	
Atypical antipsychotic	olanzapin	
Prokinetic agents	metoclopramide	
Anxiolytics	alprazolam lorazepam	

Rules for antiemetic prophylaxis
in chemotherapy treated patients

- **Prevention from the 1st cycle**
  - in emetogenic chemotherapy (moderate to high risk)
- **Use of full defined doses af antiemetics**
  - do not reduce the dose
- **Combined antiemesis recommended**
  - dexamethasone is a routine part of combination
  - add anxiolytics in anxious patients
  - monotherapy for low-risk patients
- **Oral formulation sufficient for prevention**
- **Modern antiemetics with long half life**
  - potencially 1 dose for the whole cycle of chemotherapy

Combined antiemetic prophylaxis

regimens used according to total CINV risk of the patient

Routine 2-drug regimen for moderate risk patients

$5HT_3$-inhibitor	dexamethasone	
$5HT_3$-inhibitor	dexamethasone	alprazolam

Three drug regimen for high risk of CINV

$5HT_3$-inhibitor	NK_1-inhibitor	dexamethasone	
$5HT_3$-inhibitor	NK_1-inhibitor	dexamethasone	alprazolam

Olanzapin regimen as an alternative

palonosetron	olanzapin	dexamethasone

Potencial regimen for the highest emetic risk / after failure

palonosetron	NK_1-inhibitor	olanzapin	dexametha

Akynzeo© capsules

netupitant 300 mg / palonosetron 0.5 mg

- **First fixed 2-drug combination**
  - both components with long half life
- **Inhibits two main pathways** of emesis after CT
  - covers both acute and delayed period, highly effective
- **1 capsule 1 hr prior** to the start of CT
  - effective for the whole cycle
- **Improves compliance** with antiemetic regimen
  - solves known gaps between guidelines and reality
  - decreases the risk of mistake
- **Cost-effective** despite of high charges

Cancer pain management

principles of therapy

Chronic cancer pain characteristics

two patterns: continuous or intermittent

- **Multidimensional phenomen**
  - complex interaction between many factors
  - includes psychological factors
  - causes syndrome (rather than symptome in acute pain)
- **Chronic pain may be a patogen itself**
  - can facilitate progression of metastatic disease
  - negative predictor of survival
  - worsens quality of life
- **Neuropathic pain**
  - damage to the nerves and surrounding tissues
  - pathological persisting type of pain, hyperesthesia
  - maladaptive response

Principles of cancer pain management

- **Drug therapy is the cornerstone**
- **Prescription on an around-the-clock basis**
  - using analgesic ladder
  - use combinations of analgesic drugs
- **Strong opioids for increasing and moderate to severe pain**
- **Specific treatment for neuropathic pain**
  - antiepileptics, anticonvulsants
- **Rescue doses for breakthrough pain**
  - rapidly acting formulations

Analgesic ladder

for cancer pain management

- **STEP 1**
  - **Non opioid analgetics**
    - paracetamol
    - NSAIDs
  - **Adjuvant (co-analgetics)**
    - antidepresants, anxiolytics
    - anticonvulsants, gabapentinoids
    - corticosteroids
    - cannabinoids
- **STEP 2**
  - **Weak opioids** (+- non-opioid / adjuvant)
- **STEP 3**
  - **Strong opioids** (+- non-opioid / adjuvant)

Weak opioids

for cancer pain

- **Tramadol**
  - injection i.v., i.m., s.c.
  - oral drops, short acting, dosed by 4-6 hrs
  - oral slow-release tablets, dosed bid
  - combined with paracetamol in tablets
- **Codein**
  - short-acting, dosed by 4-6 hrs
- **Dihydrocodein**
  - DHC Continus prolonged release tablets, dosed bid
- **Oxycodon low dose**

Strong opioids

for cancer pain management

- **Morphine**
  - injection s.c., i.m.
  - oral immediate-release morphine (bioavailability 20-40 %)
  - slow-release tablets / capsules, dosed bid
- **Fentanyl**
  - TD patch (transdermal), be changed by 72 hrs
  - buccal tablets (rapid resorption) for breakthrough pain
  - intranasal spray (very rapid resorption)
- **Buprenorfin TD**
- **Hydromorhone oral** (dosed bid, by 12 hrs)
- **Oxycodone oral** (dosed bid, by 12 hrs)

Recommendations for opioid therapy

distinct pharmaco-dynamic differences between individuals

- **Effective dose is very individual**
  - no ceiling effect to opioid dosing
  - side effects are usually limiting
- **Dose of opioids needs to be titrated**
  - morphine provide similar pain control as newer opioids
  - tolerance and physical dependence is predictable
  - different from psychological dependence
- **Undertreatment is common**
  - uncontrolled pain may decrease cognition, similar to opioid side-effect (for drivers)
- **Risk of opioid accumulation in renal failure**
  - buprenorfin kinetics preserved in renal insufficency

Recommendations for opioid therapy

distinct pharmaco-dynamic differences between individuals

- **Opioids should be combined with**
  - non-opioids (paracetamol, NSAIDs)
  - adjuvant drugs (antidepressants and others)
- **Opioid rotation**
  - switch to different opioid in case of tolerance or side effects to improve effect and/or lower risk of toxicity
  - equianalgesic dose caculation
- **Prophylactic laxatives**
  - useful for many patients (allow opioid continuation)
  - combination of opioid with oral naloxone
- **Use of multiple opioids simultaneosly is inappropriate**

Dose-limiting side effects of strong opioids

no defined maximal doses for strong opioids

- **Respiratory depression**
  - risk is minimal in adequate dose titration
- **Constipation and dry mouth**
  - independent of dose
- **Nausea and vomiting**
  - usually transient, resolve within days
- **Sedation, sleepiness, dizzinies**
- **Delirium, confusion**
  - dose-limiting side-effect
- **Cutaneous pruritus**

Febrile neutropenia

Management of sepsis

Febrile neutropenia (FN)

severe neutropenia increases the risk of infection

Fever	+	Neutropenia
> 38.5 °C		**< 0.5 *10^9/L**
> 38.0 °C > 1 hr		**severe neutropenia**

Not in all FN cases there is an infection.

Criteria of FN may be fulfilled in other causes of fever, like drug fever etc, but infection cannot be excluded in limited time.

Treatment should cover potential causes of infection (risk of rapid progression of infection within hours).

Different risks of febrile neutropenia

fufilling one or more characteristic features

- **High risk**
  - hematological patients (leukemia)
  - expected to continue for more than 5 days
  - very severe neutropenia < 0.1 *10^9/L

Hospital stay, i.v. broad spectrum antibiotics

- **Low risk**
  - solid cancer patients
  - short period of neutropenia < 5 days
  - not very severe (above 0.1 *10^9/L)

Outpatient, oral antibiotics

Empirical antibiotic therapy

in high-risk febrile neutropenia and sepsis

- **Start immediately after diagnosis**
  - up to 1 hr after diagnosis
  - just after collection of blood for culture (2 sets)
- **Broad spectrum antibiotics i.v.**
  - full dose recommended for severe infection

cefepime + amikacin
1st choice in this dept

add vancomycin if indicated
risk of G+ infection

meropenem + vancomycin
in hemodynamic instability

Antifungal therapy

in high risk febrile neutropenia and sepsis

- **Empirical antifungals**
  - in high risk FN
  - persisting fever despite empirical antibiotics day 5-7
  - progressive signs of infection

caspofungin *or* **micafungin**
Echinocandin class

- **Treatment** of **possible/probable** fungal infection
  - high-resolution CT of lungs (hallo sign)
  - dynamic increase in serum galactomannan
    - suspicion for ivasive pulmonary aspergillosis

voriconazole
Azole antifungal class

Diagnosis of sepsis

positive blood culture not required

Infection + SIRS

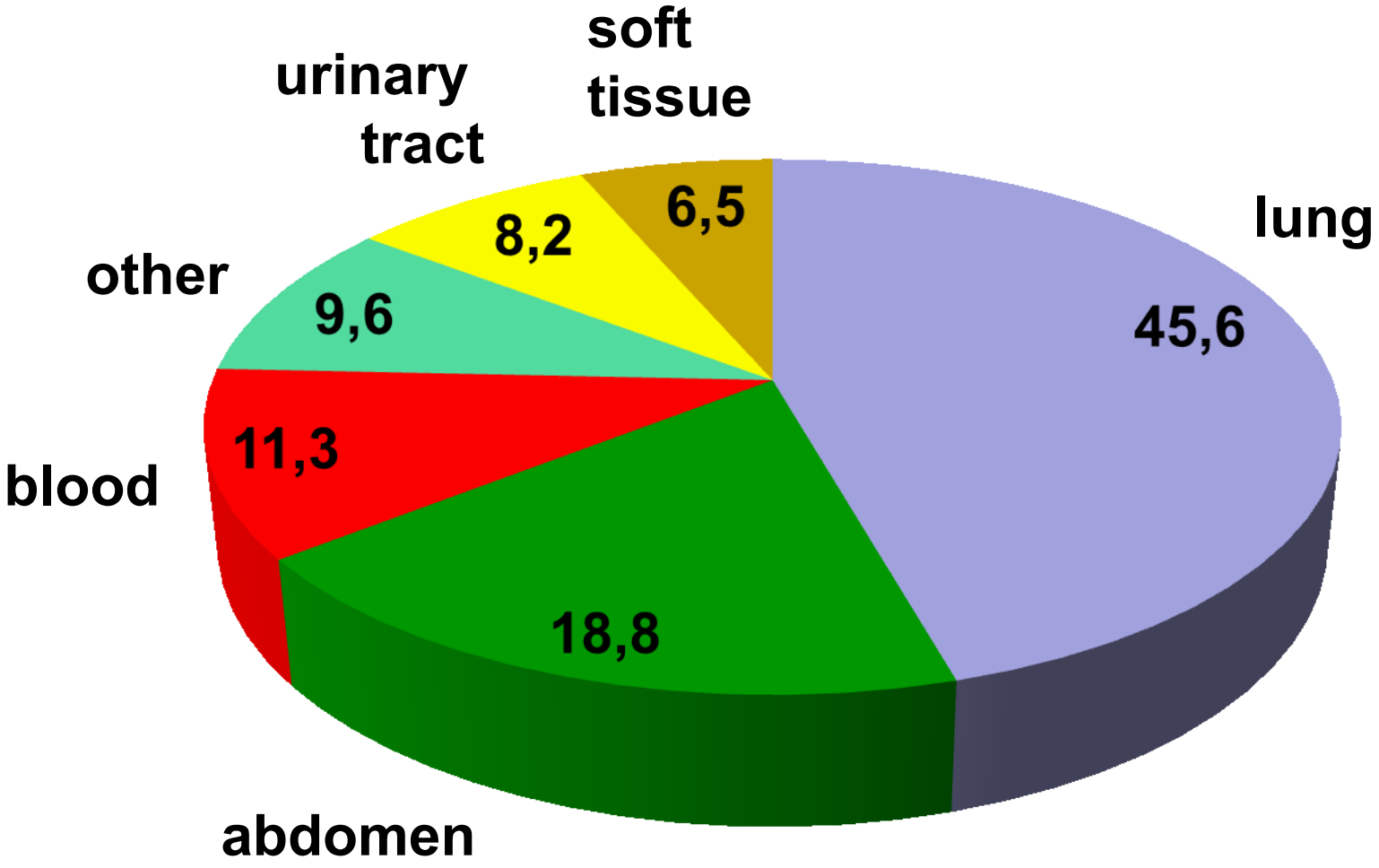
Documented

- microbiologically
  - blood stream infection
  - urinary tract infection
- clinically
  - pneumonia
  - soft tissue infection

- Fever / hypothermia
  > 38.3°C / < 36°C
- Tachycardia > 90/min.
  - in fever >100/min.
- Tachypnea > 20 bpm
  - pCO_2 < 4.2 kPa
- Leukocytosis
  - or leucopenia

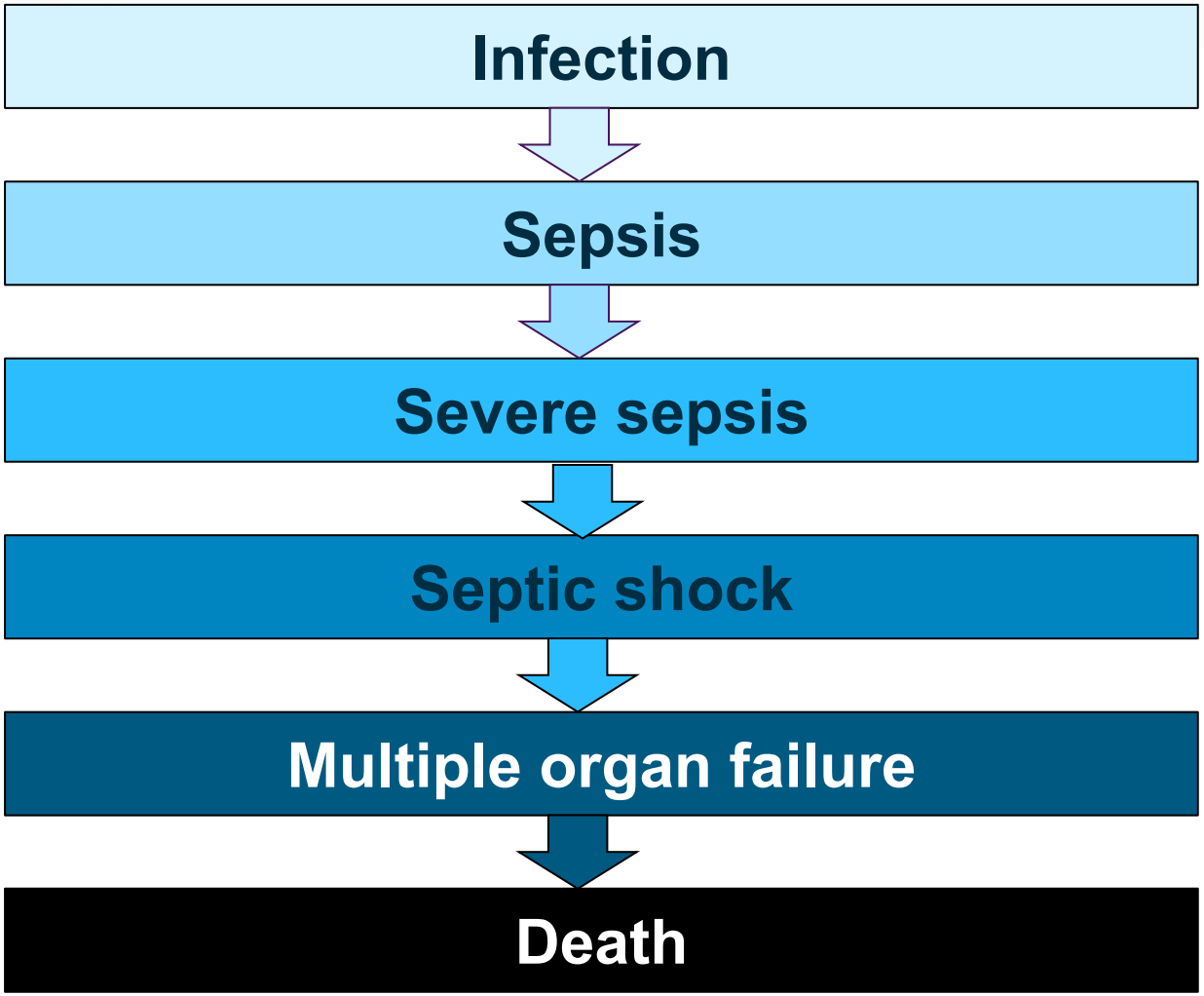
Primary site of infection in sepsis

14,364 patients, 28 ICUs, 8 countries



Sepsis continuum

in disease progression



Diagnosis of severe sepsis

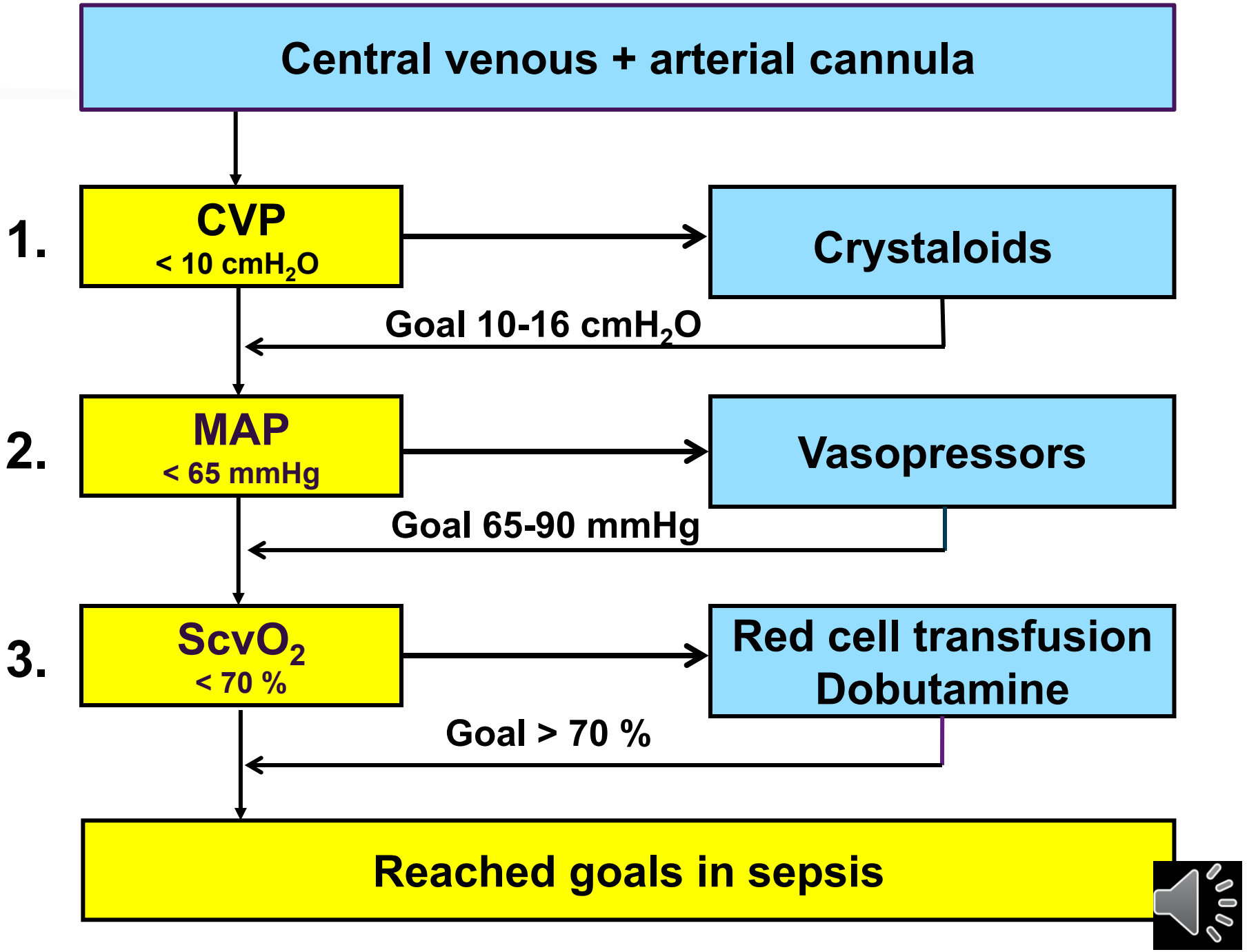
require signs of tissue hypoperfusion

- **Hypotensis responsive to i.v. hydration**
  - systolic arterial pressure < 90 mmHg
  - mean arterial pressure, MAP < 65 mmHg
- **Serum lactate > 4 mmol/L**
  - normal range 0-2
  - partially depending on liver function
- **Organ dysfunction**
  - kidney funcion: oliguria < 0.5 ml/kg/hr (< 100 ml/3 hr)
  - lung funcion: hypoxia, dyspnea
  - central nervous system: delirium, somnolence, confusion

Diagnosis of septic shock

definition

- **Sepsis induced hypotension, persisting after i.v. hydration**
  - initial hydration at least 30 mL/kg for 3 hrs
    - 2100 mL for 70 kg person in 3 hrs
- **The goal in lactate elevation is to decrease lactate level** (improve tissue perfussion)
- **Vasopressors necessary for septic shock**
  - norepinephrin is the first choice
  - MAP > 65 mmHg is the goal


Central venous + arterial cannula
1.
CVP
< 10 cmH2O
Crystaloids
Goal 10-16 cmH2O
2.
MAP
< 65 mmHg
Vasopressors
Goal 65-90 mmHg
3.
ScvO2
< 70 %
Red cell transfusion
Dobutamine
Goal > 70 %
Reached goals in sepsis

Metabolic complications in oncology

Tumor lysis syndrome, TLS

characteristics

- **Aggresive malignancy**
  - Burkitt lymphoma
  - acute leukemia
  - many other aggresive/chemosensitive tumors
- **Bulky disease** (large tumor volume)
  - high lactate-dehydrogenase (LD)
- **Clinical situations**
  - mosty occurs after first doses of chemotherapy
  - chemosensitive malignancies
  - even after corticosteroids (ALL, high-grade lymphoma)
  - rarely spontaneous TLS

Diagnosis of TLS

laboratory monitoring

- **Hyperuricemia**
  - uric acid is final metabolite of nucleic acids
  - uric acid precipitation in (in low pH)
- **Renal failure**
  - rapid onset within hours
- **Hyperkalemia**
  - may rapidly increase from morning to evening
  - bradyarrythmia, heart arrest, sudden death
- **Hyperphosphatemia**
  - calcium phosphate precipitation (in high pH)
- **Hypocalcemia**

Prevention of TLS

before starting chemotherapy

- **Prehydration**
  - start at least 12 hrs before
  - 3-6 L/day (oraly + intravenously)
  - high urine output (> 100 mL/hr) prior to chemo
  - combined with furosemide in older/cardiac patients
- **Allopurinol pretreatment**
  - start 24 hrs before starting chemo
  - 300-600 mg/day (reduction in renal insufficiency)
  - does not treat preexisting hyperuricemia
  - risk of drug-drug interactions
  - risk of xanthine nephropathy

Urate oxidase enzyme in TLS

rasburicase, recombinant urate-oxidase

- **Conversion of uric acid to allantoin**
  - 10times more soluble than uric acid
- **Reduces preexisting hyperuricemia**
  - in contrast to allopurinol
- **Rasburicase i.v. infusion**
  - plasma uric acid level rapidly decreases within 4 hrs
  - single dose 6 mg commonly sufficient
  - repeat as necessary
  - risk of anaphylaxis (< 1 %)

Monitoring of TLS

according to the risk

- **Twice daily in patients at high risk**
  - diuresis (goal > 100 mL/hr)
  - biochemistry (kreatinin, K, P, Ca)
- **Asymptomatic hypocalcemia should not be treated**
  - risk of calcium-phosphate precipitation
  - alcaliniaition of urine not recommended

Hypercalcemia in malignancy

characteristics

- **Pathophysiology in oncology**
  - osteolytic metastases (osteoclast activity)
  - parathormone-related protein produced by cancer
- **Symptoms**
  - osmotic diuresis causing dehydration
  - anorexia, nausea, vomiting
  - constipation, sometimes severe
  - confusion, central nervous system dysfunction

Treatment of hypercalcemia

in malignancy at ICU

- **Intravenous hydration**
  - saline infusion 200-300 mL/hr
  - hypovolemia exacerbates hypercalcemia
- **Calcitonin**
  - rapidly acting in 4-6 hrs, tachyphylaxis after 48 hrs
- **Bisphosphonates** (more potent than calcitonin)
  - zoledronate, pamidronate
  - maximal effect in 48-96 hrs (2-4 days)
  - potential nephrotoxicity
  - used up to kreatinin 400 umol/L
- **Disease-specific approach**
  - treatment of underlying disease

SIADH in oncology

Syndrome of inappropriate ADH secretion

- **Pathophysiology**
  - ADH caused water retention (usually mild)
  - secondary increase of natriuresis (natriuretic hormones)
  - euvolemic hyponatremia
- **Laboratory abnormalities**
  - hyponatremia (may be asymptomatic)
  - low plasma osmolality (hypoosmolar hyponatremia)
  - urine Na concentration > 20 mmol/L (natriuresis)
- **Clinical features**
  - asymptomatic hyponatremia is a common feature
  - apetite loss, headache, dizzinies, muscle weakness
  - no oedema

Etiology of SIADH in oncology

- **Underlying cancer**
  - lung cancer (SCLC)
  - mesothelioma
  - oropharyngeal, gastric, pancreatic cancer
  - malignant lymphoma
- **Drugs as a side effect**
  - antidepressants (mainly SSRI)
  - antiepileptics
  - antipsychotic agents
  - cyclophosphamide, ifosfamide, vincristin

Treatment of SIADH

- **Water restriction**
  - to 800-1000 mL daily
- **Furosemide**
  - eliminates more water than sodium
- **Sodium chloride infusion**
  - normal saline (0.9 % solution)
  - slow gradual correction of natremia
  - not faster than by 0.5-1 mmol Na in 1 hour
  - rarely hypertonic saline (3% solution)
- **Vasopresin receptor antagonists**
  - acting on renal tubuli blocking V_2R

Nutrition support in cancer

Diagnosis of malnutrition

is based on simple clinical findings

- **Unwanted weight loss > 10 % per 6 months**
  - prognostically different from weight reduction
  - also applies to overweight and obese patients
- **Decreased BMI**
  - interpretation depends on age and gender
- **Insufficient food intake**
  - less than 60 % of usual intake more than 10 days
- **Nutrition impact symptoms**
  - increase risk and probability of reduced food intake
- **Serum albumin is not a reliable marker**

Median overall survival in cancer patients

in months, according to baseline weight loss and BMI

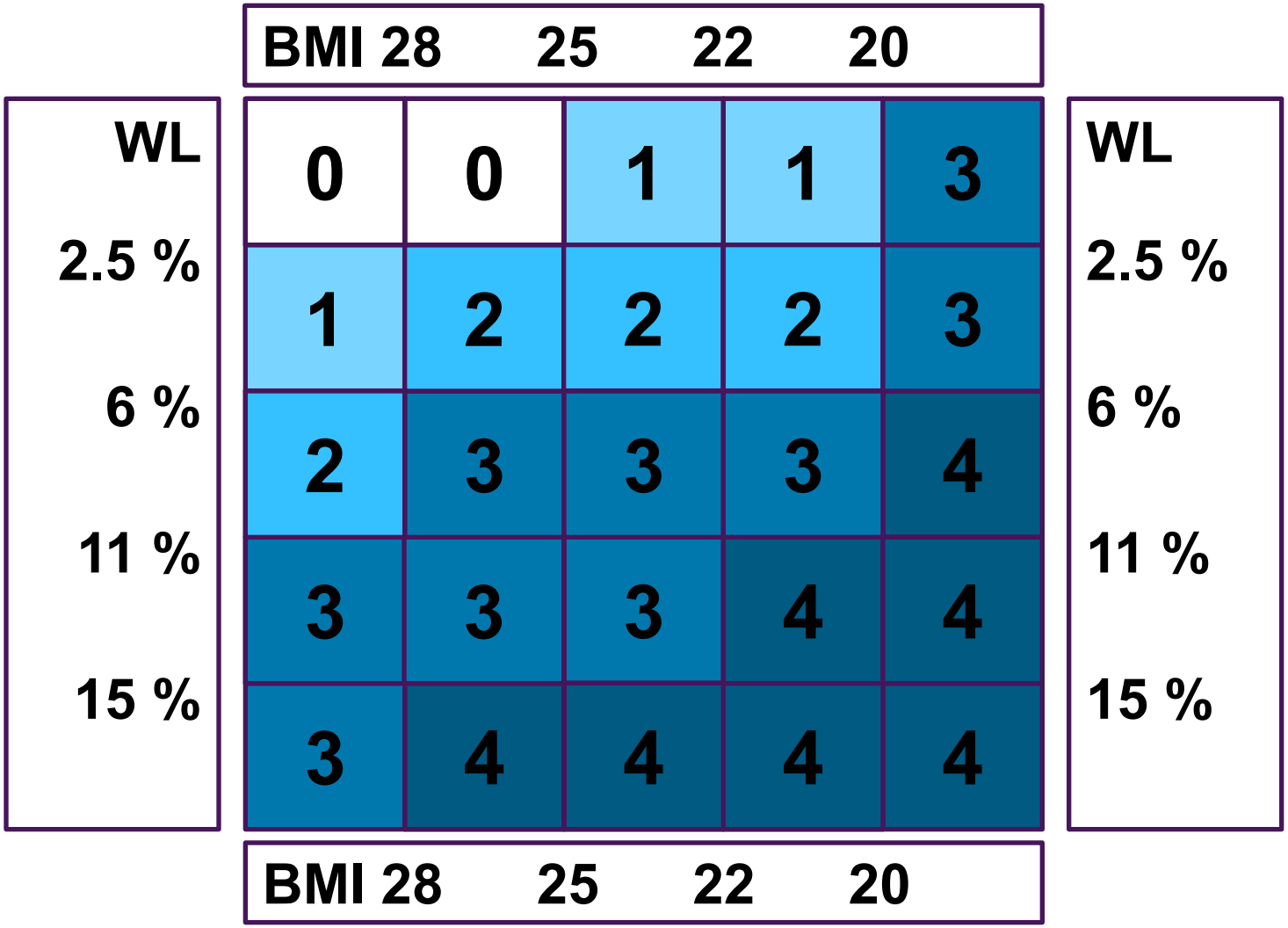
n=8160

WL	BMI 28	25	22	20	
2.5 %	21.5	19.9	15.7	13.5	8.4	17.3
6 %	14.2	11.9	10.5	10.6	7.8	11.3
11 %	10.7	9.2	6.8	6.7	4.7	7.5
15 %	8.1	8.1	6.2	5.4	4.4	6.2
	7.1	4.8	4.7	3.7	4.1	4.4
	13.1	10.2	8.1	6.1	4.7	

Martin L…Baracos V. J Clin Oncol 2015; 33:90-99.

Grading of weight loss in cancer patients

worsening prognosis through grades 1-4



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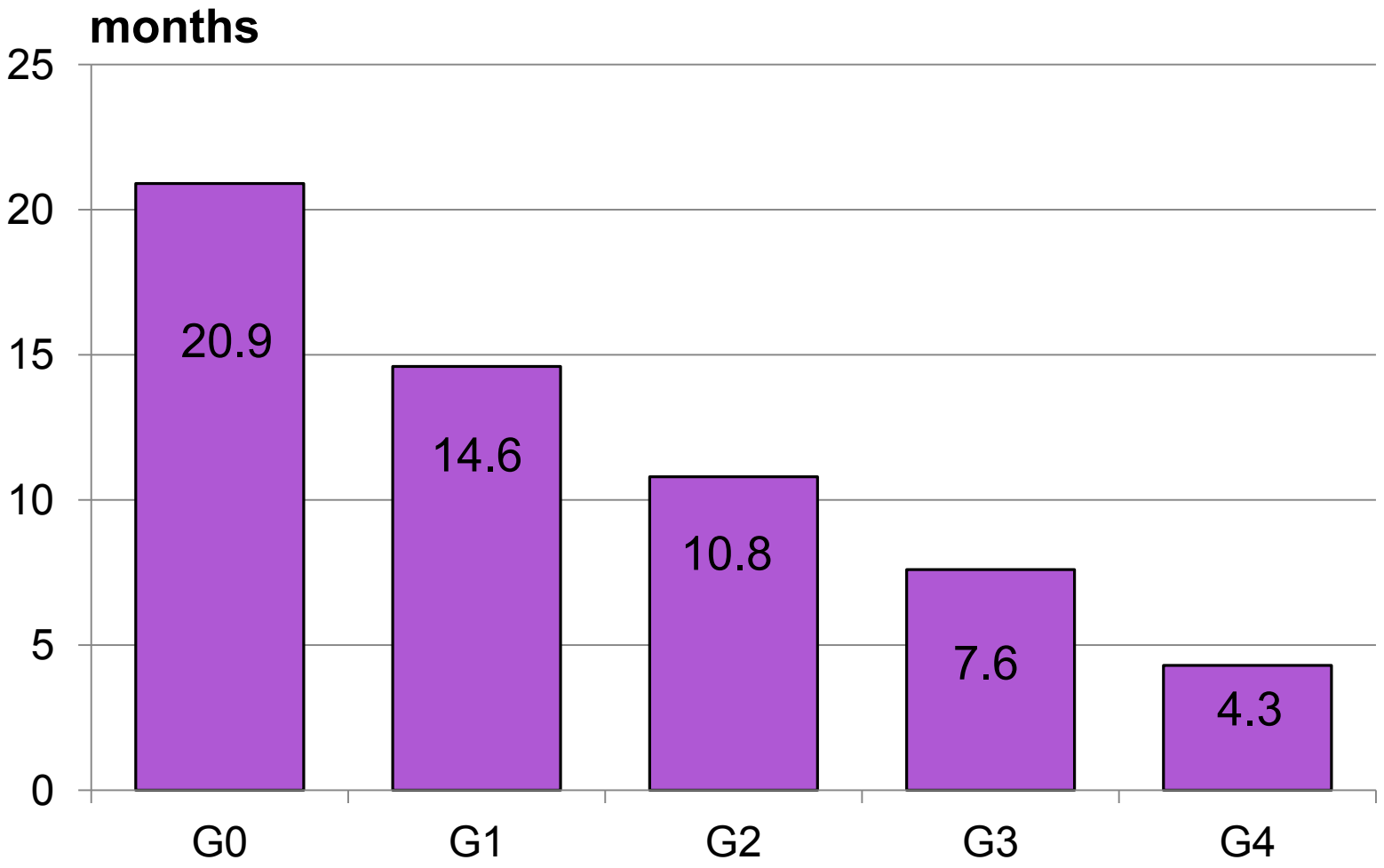
Median overall survival in cancer patients

by grading of weight loss, n=8160



Martin L … Baracos V. J Clin Oncol 2015; 33:90-99. [46]

Interpretation of BMI for diagnosis of underweight

low BMI alone should not be classified as malnutrition

	Age 18-25 *yr*	Age 25-65 *roků*	Age > 65 *roků*
BMI muži	**19.0**	**20.5**	**22.0**
BMI ženy	**18.5**	**20.0**	**22.0**

Example: BMI below 22 kg/m2 in seniors is in the range of underweigt and may support the diagnosis of malnutrition

High correlation of Mid Arm Circumference, MAC with BMI, n=1561

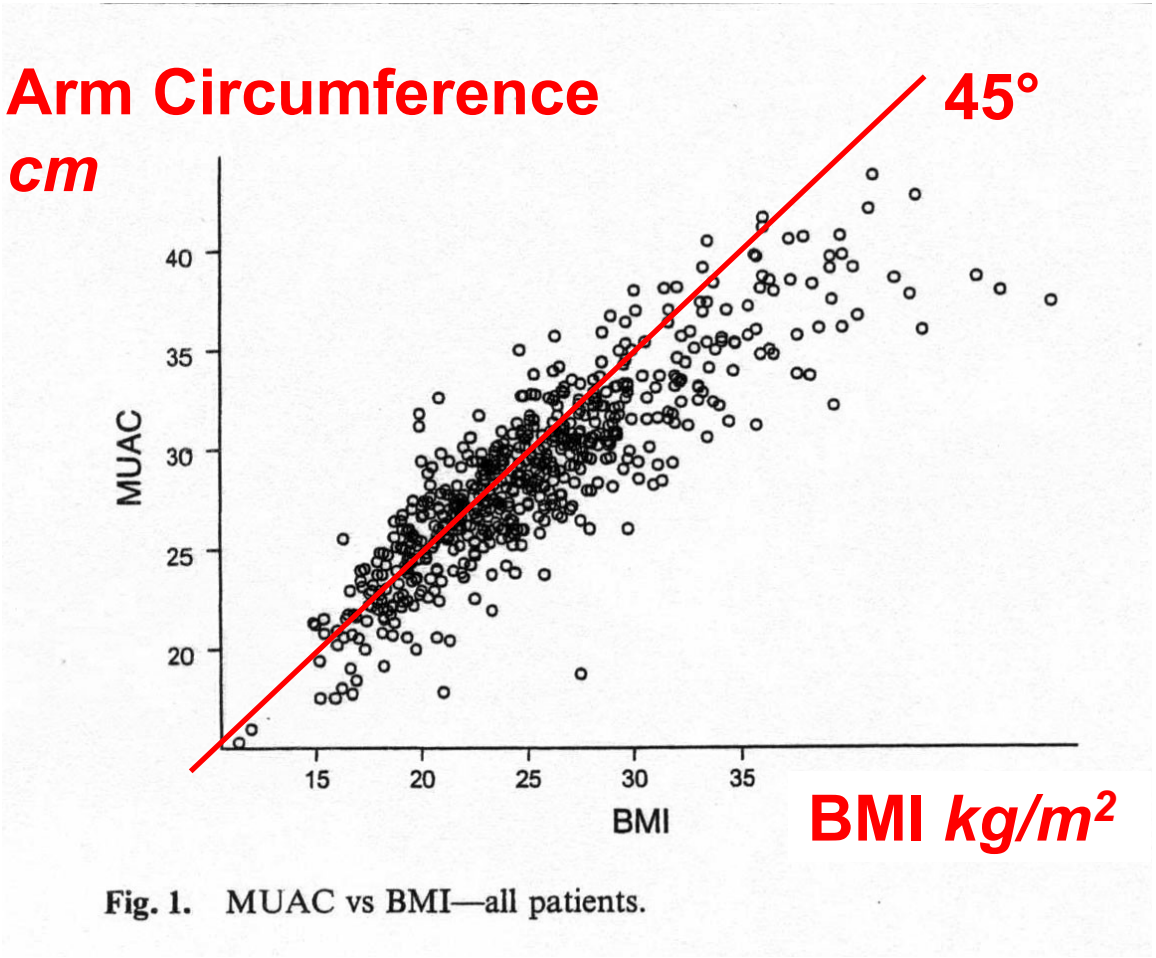


Fig. 1. MUAC vs BMI—all patients.

Change of 1 BMI unit
(3 kg for 173 cm height)
reflects 1 cm of MAC

3 mm change of MAC
reflects change 1 kg
in body weight

Applies to mid stature
173 cm ($1.73^2 = 3,0$)

There is approx. 5 unit
difference
between MAC and BMI

Powell-Tuck, Hennessy, Clinical Nutrition 2003, str.307-312

Mid Arm Circumferencer, MAC

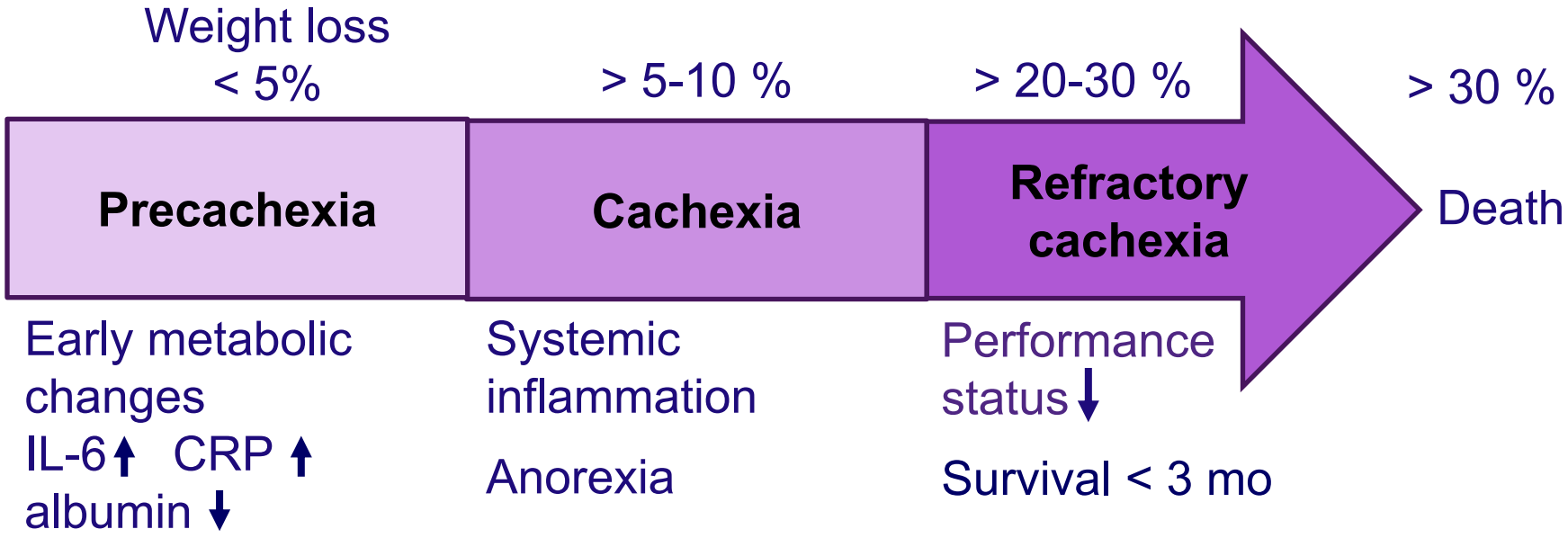
cut-off values for diagnosis of malnutrition

OP	Normal (median) *cm*	Mild malnutrition *cm*	Severe malnutrition *cm*
Males	**31.0**	**26.0**	**23.0**
Females	**30.0**	**25.0**	**22.0**

Applies to mid stature around 173 cm.
Excellent parameter in fluid retention, edema, ascites.

Cancer cachexia

is characterized by metabolic abnormalities
with systemic inflammation in many, but not all patients,
progressive loss of skeletal muscle mass is crucial



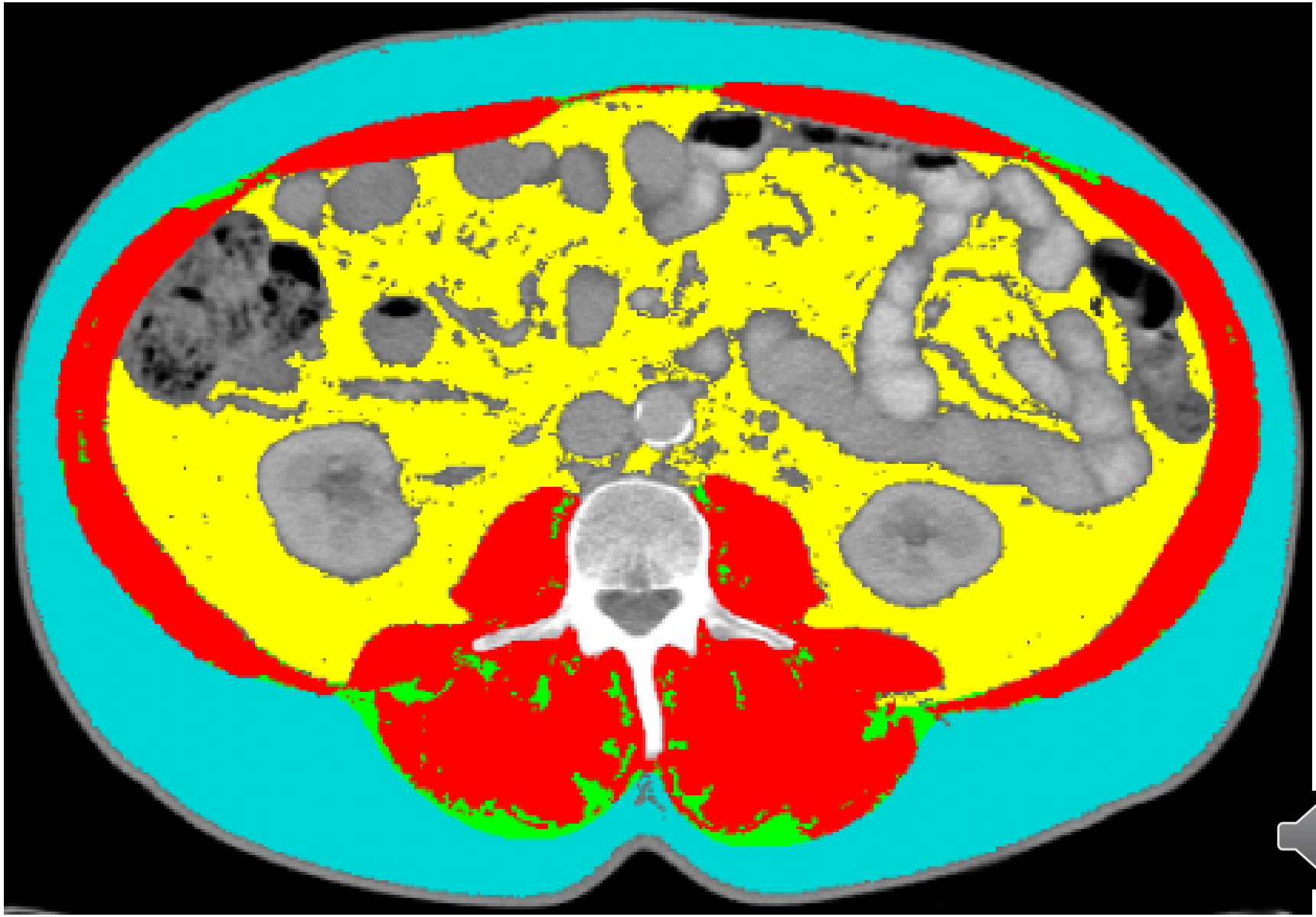
Glasgow Prognostic Score, GPS, range 0-2 points

CRP > 10 mg/L
Albumin < 35 g/L

Score 1-2 points (in the absence of infection)
reflects systemic inflammation, cancer cachexi
and poor prognosis

Muscle area by CT at L3 level

enables calculation of total body muscle mass



Total energy requirements in cancer patients

Common low physical activity	**25-30 kcal/kg/Day**
	1.4 * BEE
Higher physical activity mostly younger pts. and males	**30-35 kcal/kg/Day**
	1.5 * BEE
Malnutrition, after weight loss mostly younger pts. and males	**35-40 kcal/kg/Day**
	1.6 * BEE

Expression per kilo BW applies to normal weight patients (normal BMI). Corrected weight is used for overweight and underweight (to the middle between Ideal BW (BMI 22 for mid age, 24 for seniors) and Actual BW.

Protein requirements in cancer patients

delivery of increased needs in cancer is safe

Mild / moderte malnutrition	**1.2-1.5 g/kg/Day**
Severe malnutrition	**1.5-2.0 g/kg/Day**
Renal isufficiency	**1.0-1.2 g/kg/Day**

Expression per kilo BW applies to normal weight patients (normal BMI). Corrected weight is used for overweight and underweight (to the middle between Ideal BW (BMI 22 for mid age, 24 for seniors) and Actual BW.

Dietary counselling

in cancer patient with anorexia/nausea

- **Releive unnecessary dietary restrictions**
- **Treat nutrition impact symptoms**
  - pain, nausea, anorexia, diarhea, constipation
- **Eat small portions 5-6 times a day**
- **Keep variety of foods**
- **Take energy dense foods**
  - increase fat intake
- **Increase protein intake**
- **Easy access to food snacks**
- **Attractive serving of meals**

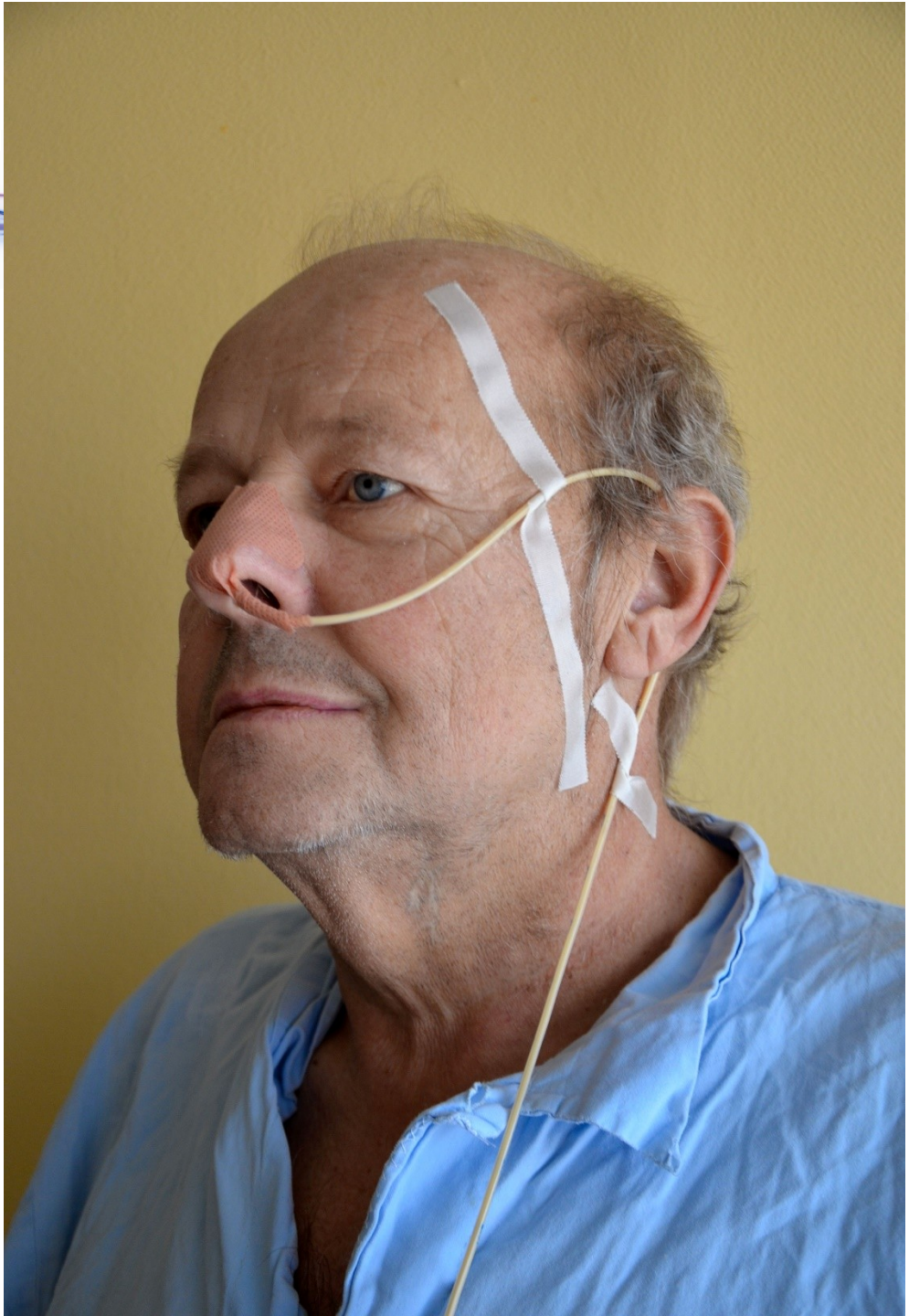
Oral Nutritional Supplements, ONS

ready to use for sipping, 125-300 mL/can

- **Complete formulas for oral intake**
  - high content of energy, proteins, vitamines
  - specific composition (omega-3 fatty acids)
- **Liquid or creme consistency**
- **Cans 125 ml, 200 ml, 220 ml, 300 ml**
- **Many different tastes**
- **Easy used** in **dental** and **swallowing problems**
- **Easily digestable**
- **Success** with **ONS depends** on **adequate motivation** and **individual approach**

Classification of ONS

Category	Characteristic
High Protein	20 g proteins / can
High Energy	2 kcal / mL
Small volume	125 ml, concentrated up to 3.2 kcal / ml
Large volume	300 ml, up to 600 kcal / can
Diabetic formula	low glycemic index
Omega-3 PUFA	0.75-1 g EPA / can
Muscle support	HMB, high protein / vitamin D



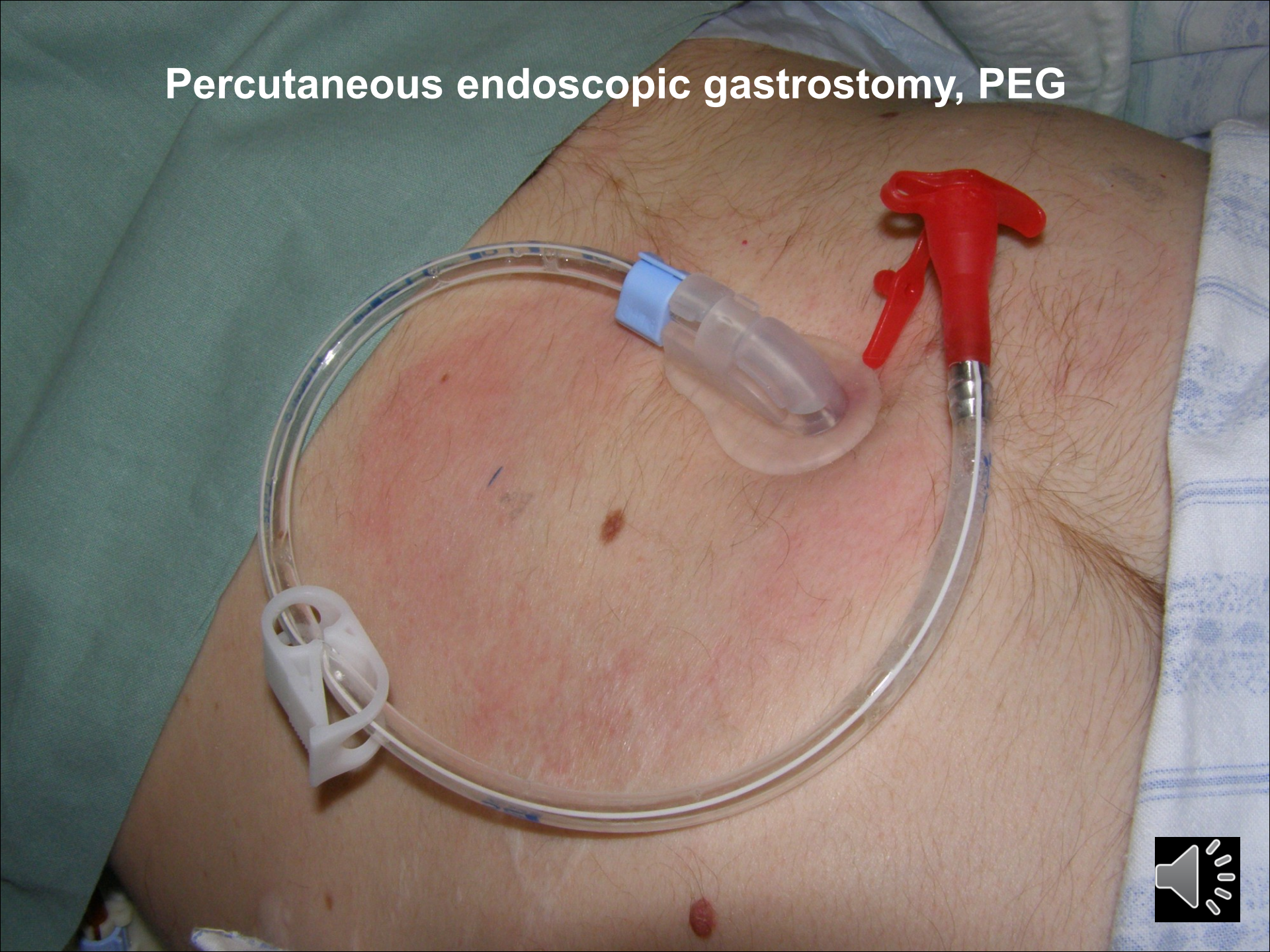
Fine bore NG tube

introduced by guidewire
for nasogastric feeding

Importance of fixation
to face

Polyuretan material
for use up to 3 months

Percutaneous endoscopic gastrostomy, PEG



Classification of products for tube feeding

Category	Characteristic	Signed
Standard	1.0 kcal / mL	Standard
Energy	1.5 kcal / mL (2 kcal / mL) 1500-2000 kcal / 1 L	Energy
High Protein	75-100 g proteins / 1 L	HP
Containing fibre	15 g fibre / 1L	Fibre
Diabetic formula	low glycemic index contains soluble fibre	Dia-, Dib- Glu-
Omega-3 PUFA	2 g EPA / daily dose of energy	
Muscle support	hydroxy-methyl-butyrate, HMB high protein and vitamin D	

Total parenteral nutrition (TPN)
in cancer patients

- **Enteral nutrition cannot be used**
  - bowel obstruction and other contrasindications
- **Survival is more limited by malnutrition than progression of cancer**
- **Life expectancy > 3 months**
  - only patients surviving more than 2 mo profit from PN
- **Performance status KPSI > 50, ECOG 0-2**
  - ability to walk even upstairs
- **Family consensus, good background**
- **Start only after meticulous deliberation**
  - decision should not come from despair
  - PN should not prolong suffering

Supplemental parenteral nutrition, Suppl PN

new modality of nutrition support in cancer patients

Potential indication

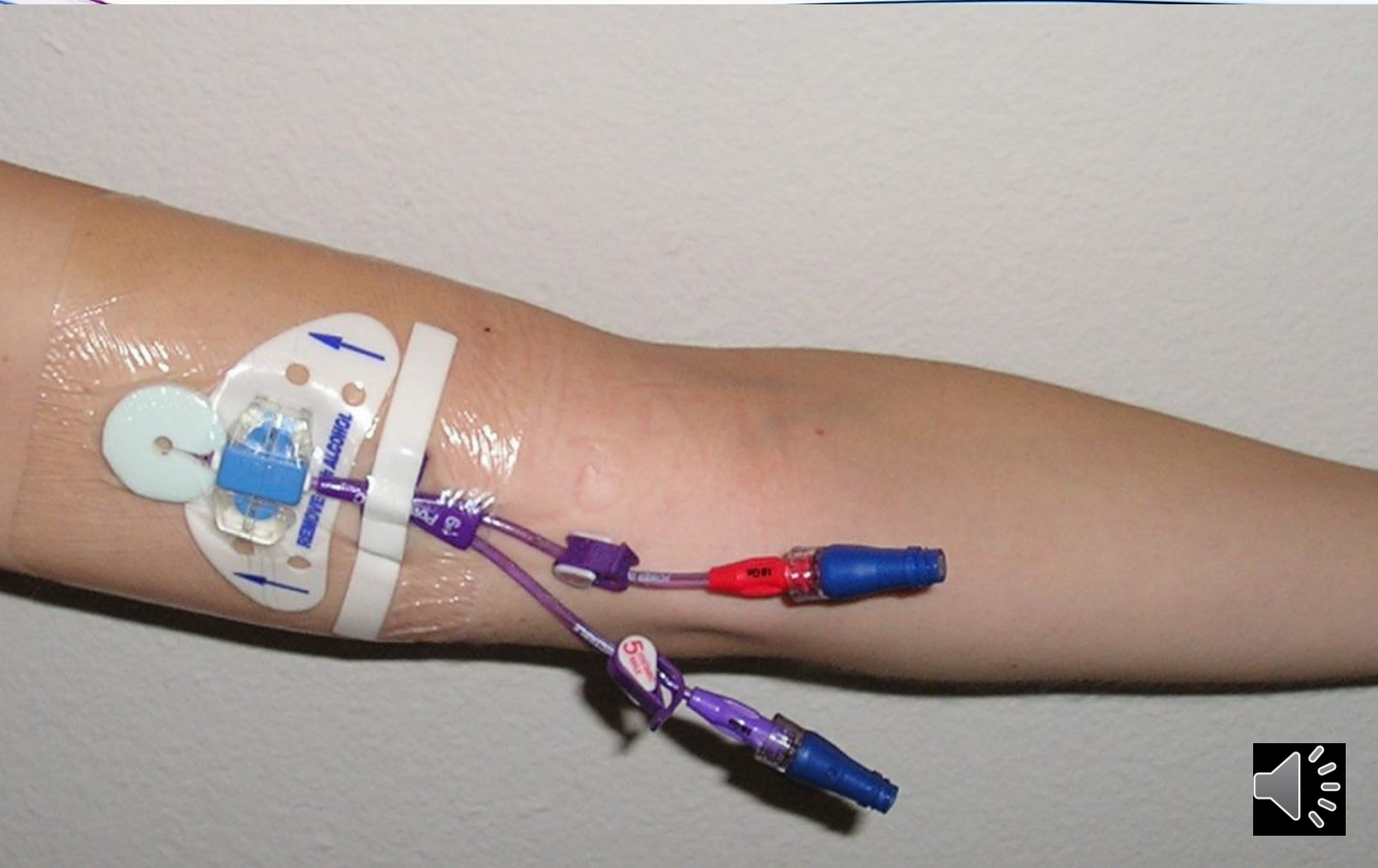
- **Insufficient food intake**
  - inability to deliver more nutrients through GI tract
  - signs of malabsorption (diarrhea)
- **Continuing weight loss**
  - despite oral nutritional intervention with ONS
- **Malnutrition has not been severe so far**
- **Advanced cancer, but death is not imminent**
  - cancer is not rapidly progressive
- **For multimodal paliative care**

Advantages of supplemental PN

- **Partially preserved enteral intake**
  - supporting bowel function
- **Lower amount of i.v. nutrients**
  - lower side effects (hyperglycemia etc.)
  - lower risk of canulla infection
  - shorter time of delivery
- **Patient need not take PN each day**
  - depending on oral intake and body weight
  - free days from PN
- **Helps to keep body weight / muscle mass**
- **Improvement of Quality of Life**

PICC, Peripherally Inserted Central Catheter

tip of catether in superior vena cava



Nutriflex Omega Special 1250 ml

3-chamber bag

1475 kcal
6100 kJ

Aminoacids 70 g
Glucose 180 g
Fat 50 g
EPA+DHA 3.1 g

SMOF Kabiven 986 ml

for supplemental PN

Content

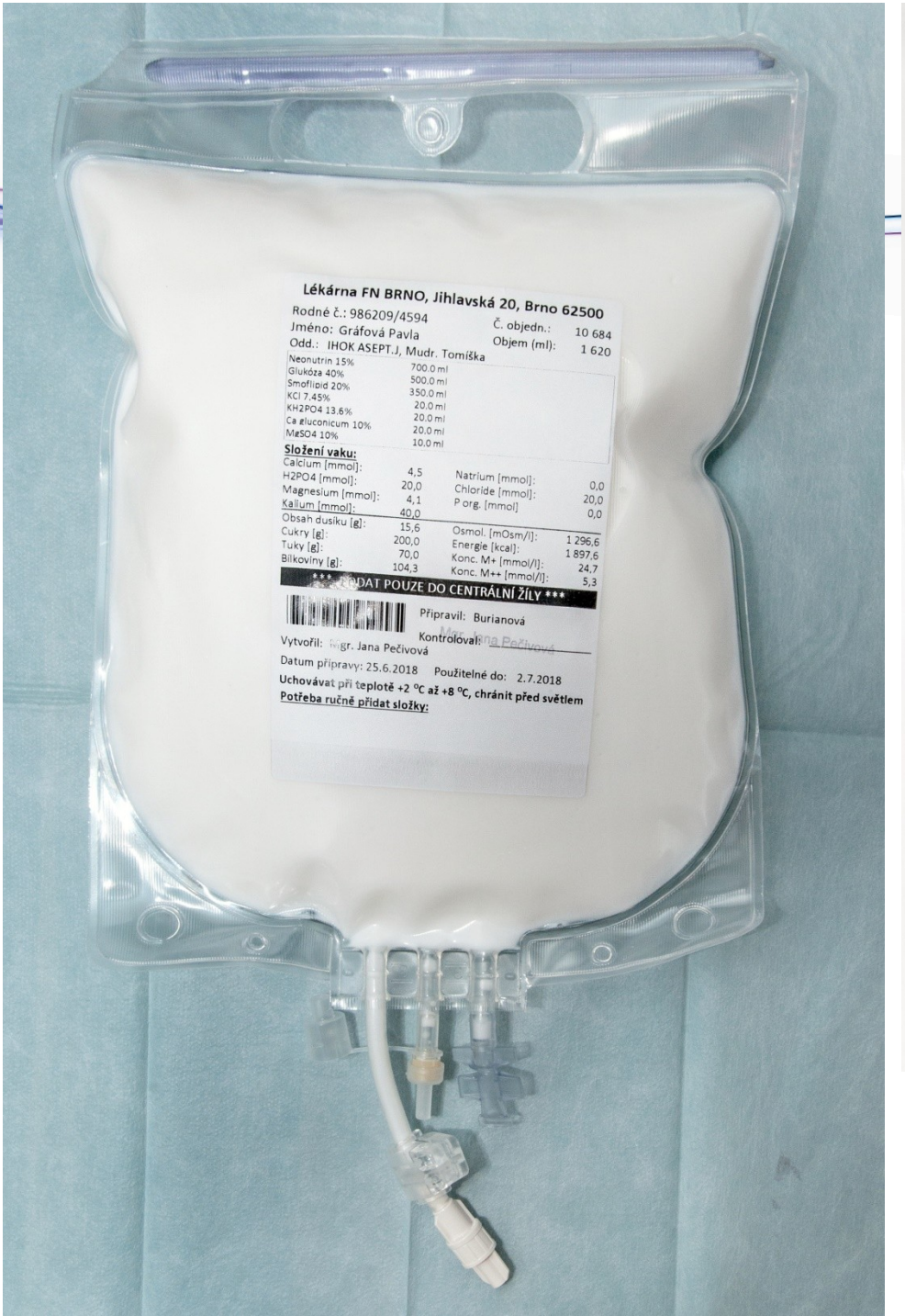
1100 kcal
4600 kJ

AA 50 g
Glucose 125 g
Fat 38 g

4-component fat emulsion

S	**soya**
M	**MCT**
O	**oliv oil**
F	**fish oil**

Preparation of „All in one“ admixture in hospital pharmacy



Lékárna FN BRNO, Jihlavská 20, Brno 62500

Rodné č.: 986209/4594 Č. objedn.: 10 684

Jméno: Gráfová Pavla Objem (ml): 1 620

Odd.: IHOK ASEPT.J, Mudr. Tomíška

Neonutrin 15%	700.0 ml
Glukóza 40%	500.0 ml
Smoflipid 20%	350.0 ml
KCl 7,45%	20,0 ml
KH2PO4 13,6%	20,0 ml
Ca gluconicum 10%	20,0 ml
MgSO4 10%	10,0 ml

Složení vaku:

Calcium [mmol]:	4,5	Natrium [mmol]:	0,0
H2PO4 [mmol]:	20,0	Chloride [mmol]:	20,0
Magnesium [mmol]:	4,1	P org. [mmol]	0,0
Kalium [mmol]:	40,0		
Obsah dusíku [g]:	15,6	Osmol. [mOsm/l]:	1 296,6
Cukry [g]:	200,0	Energie [kcal]:	1 897,6
Tuky [g]:	70,0	Konc. M+ [mmol/l]:	24,7
Bílkoviny [g]:	104,3	Konc. M++ [mmol/l]:	5,3

*** PODAT POUZE DO CENTRÁLNÍ ŽÍLY ***

Připravil: Burianová

Kontroloval: Mgr. Jana Pečivová

Vytvořil: Mgr. Jana Pečivová

Datum přípravy: 25.6.2018 Použitelné do: 2.7.2018

Uchovávat při teplotě +2 °C až +8 °C, chránit před světlem

Potřeba ručně přidat složky:

AiO bag, individualized dose of nutrients for 24 hr

New mixture of vitamins Viant®

contains all 13 vitamins

Vitamin		Unit	Requirement iv.	Viant lag.
B_1	Thiamine	mg	6	6
B_2	Riboflavin	mg	3.6	3.6
B_3	Nikotinamidum	mg	40	40
B_5	Ac.pantothenicum	mg	15	15
B_6	Pyridoxin	mg	6	6
B_7	Biotin	µg	60	60
B_9	Acidum folicum	µg	600	600
B_{12}	Cyanokobalamin	µg	5	5
C	Ascorbic acid	mg	200	200

New mixture of vitamins Viant®

contains all 13 vitamins

Vitamin		Unit	Requirement iv.	Viant lag.
A	Retinol equivalent	μg	800-1000	1000
D_3	Cholecalciferol	μg	20	5
E	Tocoferol-α eqival.	mg	10	9.1
K_1	Phytomenadion	μg	150	150

Nutryelt®

new composition contains 9 trace elements

Trace element		Unit	Requirement iv.	Nutryelt
Zn	Zink	mg	3-6.5	**10**
Se	Selenium	µg	60-100	**70**
Fe	Iron	mg	1,2	**1**
Cu	Copper	µg	300-500	**300**
Mn	Manganese	µg	60-100	**55**
F	Fluor	µg	950	**950**
I	Iodine	µg	130	**130**
Mo	Molybdenum	µg	19	**20**
Cr	Chromium	µg	10-20	**10**

The end