Nutrition in geriatrics – a look at the ESPEN guidelines

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Key-messages

- **Malnutrition** in old persons are often combined with
  - **sarcopenia** and
  - **frailty**
- New diagnostic criteria according to **GLIM** combines
  - Weight loss, low BMI, muscle mass↓
  - Reduced food intake, inflammatory disease
- **ESPEN guideline** on nutrition and hydration in geriatrics
  - 82 recommendations based on 337 papers: SR and RCTs
  - Grades of recommendation (A, B, 0, GPP (good practice point))
    - 15 Grade A recommendations, >50% ”expert agreement”
  - Strength of consensus; >90% in most recommendations

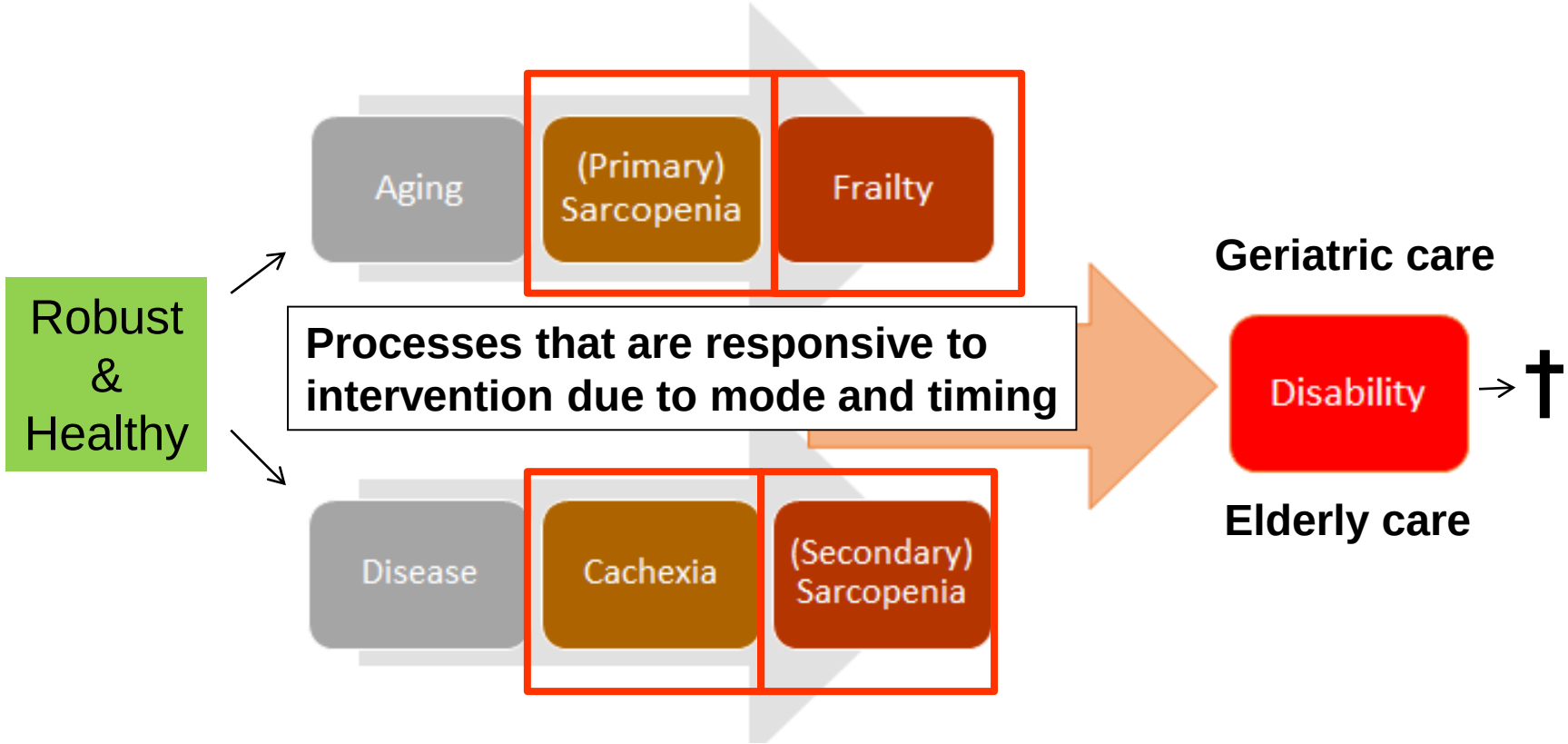
ESPEN guideline on clinical nutrition and hydration in geriatrics

82 recommendations - based on 337 papers, multi-stage Delphi process, voting among ESPEN membership

- ***Basics – general principles*** **(11 rec.)**
  - **Screen routinely folllowed by systematic assessment**
  - **Individualize; 30 kcal/kg bw/d, 1 g protein/kg bw/d**
- ***Malnutriton*** **(31 rec.)**
  - **If ONS; provide >400 kcal and 30 g protein/d – Grade A**
- ***Specific diseases*** **(18 rec.)**
  - **Hip fracture: Provide older patiens with ONS postop**
- ***Hydration*** **(22 rec.)**
  - **Women: 1.6 L drinks/d**
  - **Men: 2 L drinks/d**

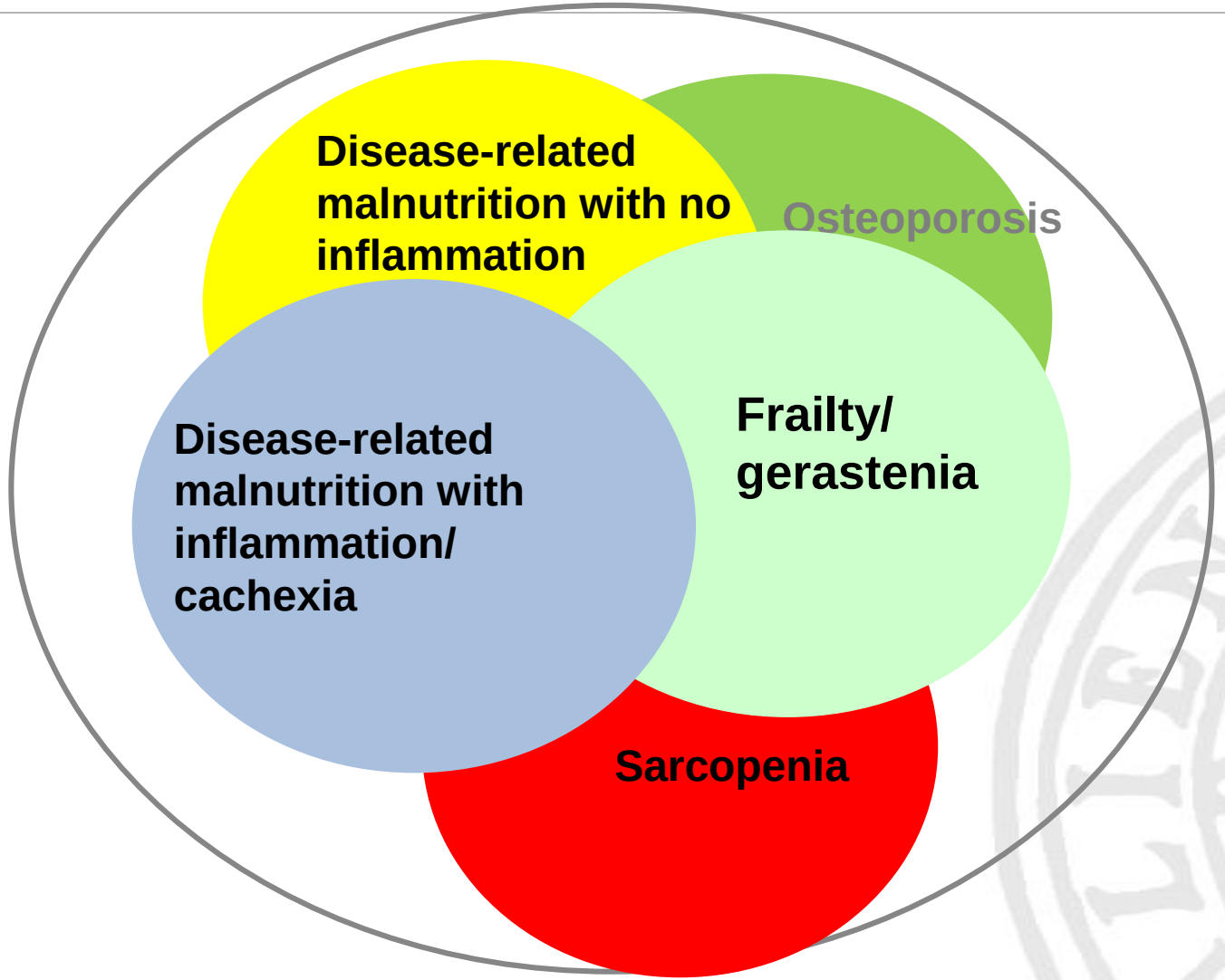
Volkert et al et al. Clin Nutr 2018

Ageing & disease → disability & †



Malnutrition, sarcopenia and frailty are risk factors for disability and death

Overlapping catabolic conditions related to reduced function at old age



Shared etiologies of malnutrition, sarcopenia and physical frailty

Inflammation
ageing, disease, dysbiosis

Inactivity/bed rest

Nutritional deficiencies
"anorexia of aging", protein RDI too low

Hormonopause
testosteron↓, estrogen↓, DHEA↓, GH↓, IGF-I↓

Insulin resistance
relative obesity, inflammation

Apoptosis↑
Caspase activation, mitochondria DNA mutations

Motor-unit losses (~50% between 25 and 75 y)
neuro-muscular synaptic damage

Microbiota/Dysbiosis
"Leaky gut"

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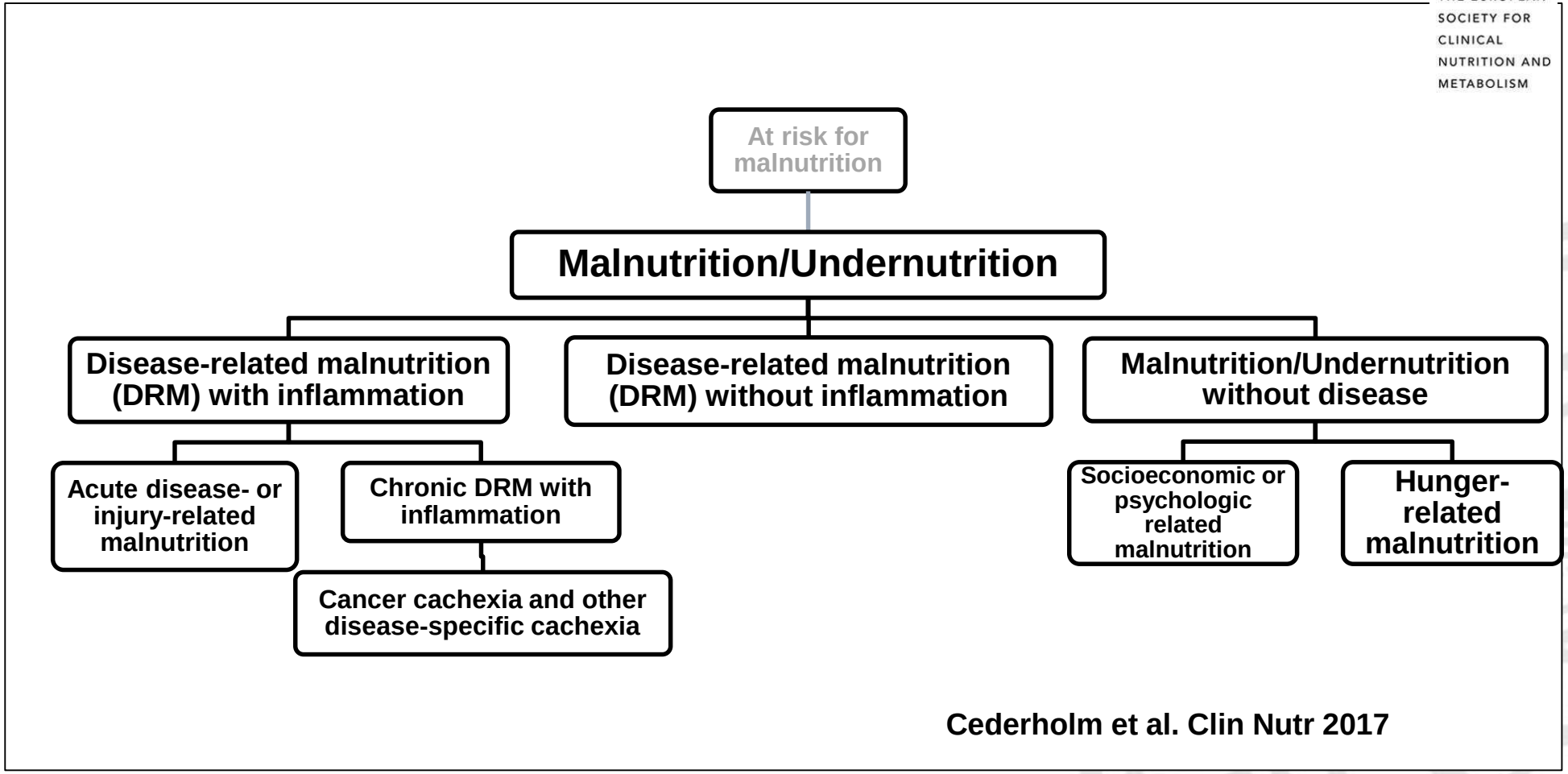
ESPEN Guidelines on Definitions and Terminology

Malnutrition diagnosis scheme

ESPEN THE EUROPEAN SOCIETY FOR CLINICAL NUTRITION AND METABOLISM



Cederholm et al. Clin Nutr 2017

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ESPEN Guidelines on Definitions and Terminology

Malnutrition without inflammation

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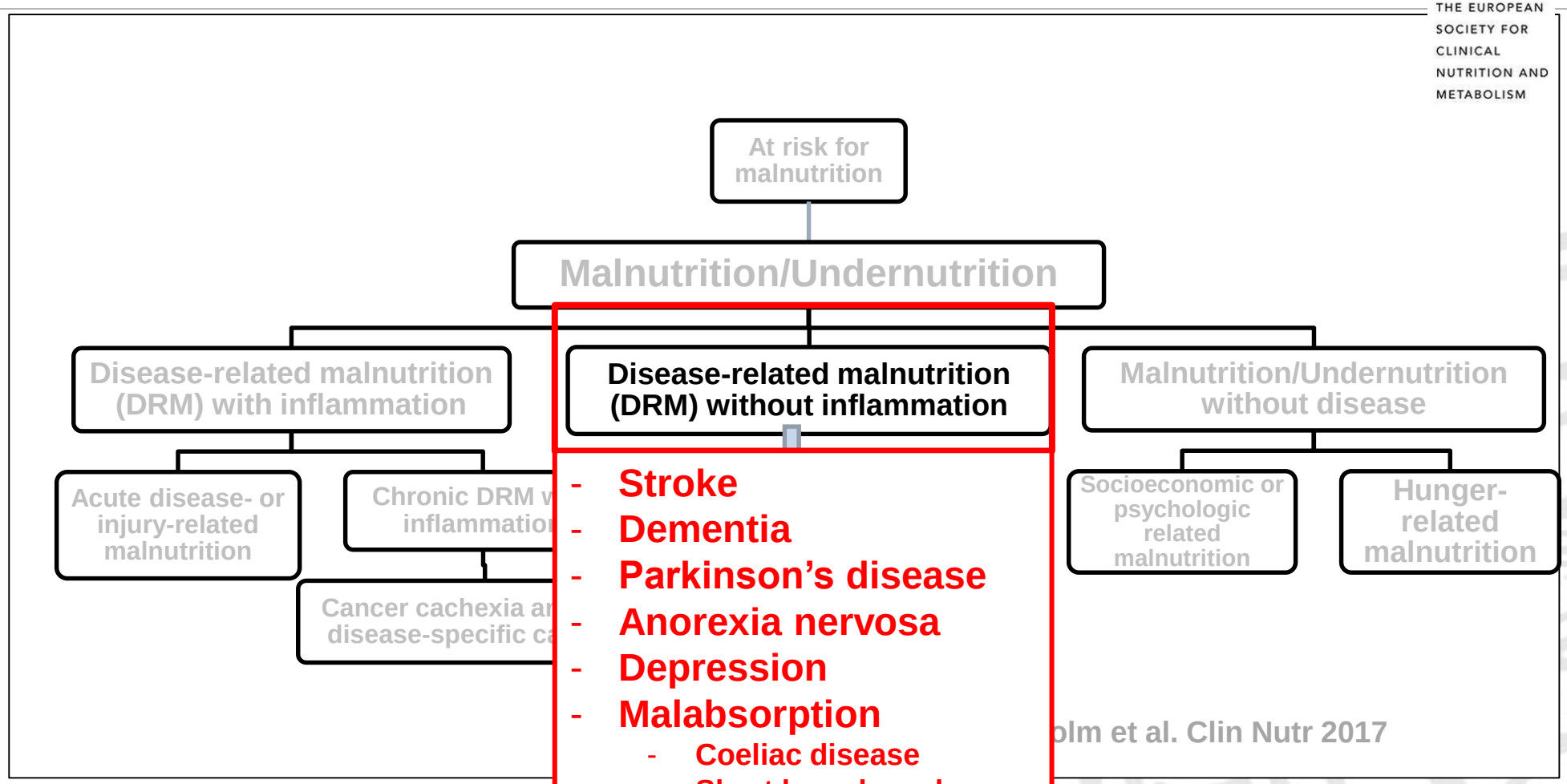
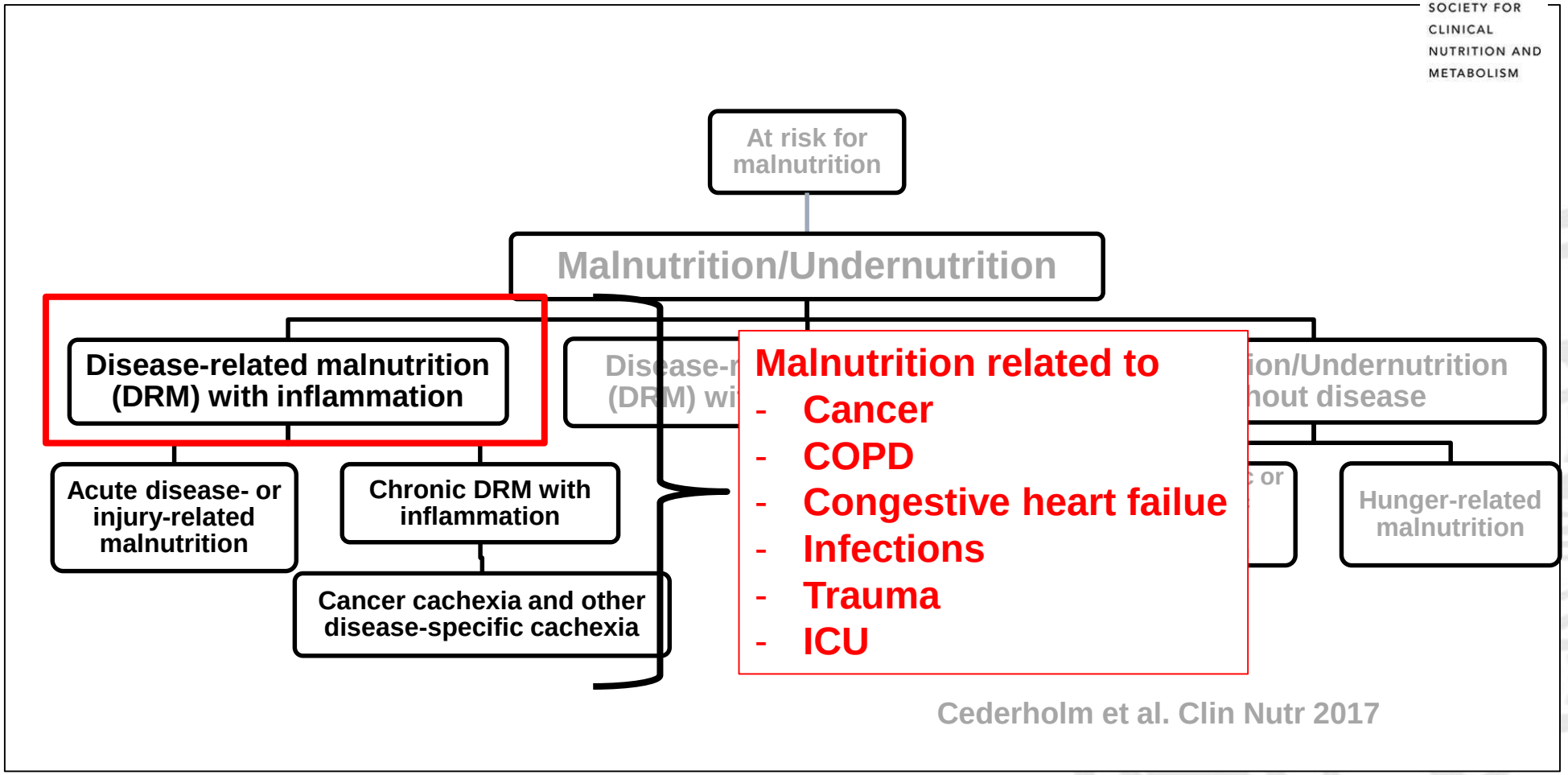


Malnutrition with inflammation



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Efforts in the search for the optimal malnutrition diagnosis tool for global acceptance

- Subjective Global Assessment (SGA) 1987
- Patient-Generated (PG)-SGA 1995
- Mini Nutritional Assessment (MNA) 1999
- Malnutrition Universal Screening Tool (MUST) 2000
- MNA-Short Form (MNA-SF) 2001
- Nutritional Risk Screening-2002 (NRS-2002) 2002
- Cachexia (by Evans) 2008
- Protein Energy Wasting (kidney) 2008
- ESPEN 2010
- Cancer cachexia (by Fearon) 2011
- AND/ASPEN 2012
- ESPEN 2015

Global Leadership Initiative on Malnutrition
A GLIM Pathway to Consensus 2016-2018

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aspen
American Society for Parenteral and Enteral Nutrition

ESPEN, ASPEN, FELANPE, PENSA

- **Modified Delphi process**
- **GLIM face-to-face meetings**
  - CNW/Austin Jan 2016
  - ESPEN/Copenhagen Sept 2016
  - CNW/Orlando Feb 2017
  - ESPEN/The Hague Sept 2017
  - ASPEN/Las Vegas Jan 2018
  - ESPEN/Madrid Sept 2018

eFELANPE

PENSA

JPEN

Jensen. JPEN 2016
Jensen & Cederholm. JPEN 2017
Cederholm & Jensen. Clin Nutr 2017

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Survey of criteria used in existing tools

	NRS-2002	MNA-SF	MUST	ESPEN 2015	ASPEN/ AND 2012	SGA	Evans 2008	Fearon 2011
Etiology								
Reduced food intake	Y	Y	Y	Y	Y	Y		Y
Severe disease /Inflammation	Y	Y	Y	Y	Y	Y	Y	Y
Symptoms								
Anorexia		Y				Y	Y	Y
Weakness		Y				Y	Y	
Signs/Phenotype								
Weight loss	Y	Y	Y	Y	Y	Y	Y	Y
Body mass index	Y	Y	Y	Y			Y	Y
Lean/fat free /muscle mass		Y		Y	Y	Y	Y	Y
Fat mass					Y	Y		
Fluid retention					Y	Y		
Muscle function; e.g. grip strength					Y		Y	

GLIM consensus criteria decided

	NRS-2002	MNA-SF	MUST	ESPEN 2015	ASPEN/ AND 2012	SGA	Evans 2008	Fearon 2011
Etiologic criteria								
Reduced food intake	Y	Y	Y	Y	Y	Y		Y
Severe disease /Inflammation	Y	Y	Y	Y	Y	Y	Y	Y
Phenotypic criteria								
Weight loss	Y	Y	Y	Y	Y	Y	Y	Y
Body mass index	Y	Y	Y	Y			Y	Y
Lean/fat free /muscle mass		Y		Y	Y	Y	Y	Y

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The GLIM criteria co-published in Clin Nutr, JPEN and JCSM 2018

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American Society for Parenteral and Enteral Nutrition

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ESPEN Endorsed Recommendation

GLIM criteria for the diagnosis of malnutrition – A consensus report from the global clinical nutrition community☆

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The GLIM procedure for the diagnosis of malnutrition

Risk screening

At risk for malnutrition
- Use validated screening tools

Diagnostic Assessment

Diagnostic Criteria

Phenotype
- Weight loss
- Low BMI/underweight
- Reduced muscle mass

Etiology
- Decreased food intake or absorption
- Disease burden/inflammatory condition

Diagnosis

Meets criteria for malnutrition diagnosis
- Requires at least 1 Phenotype Criterion and 1 Etiology Criterion

Severity grading

Determine severity of malnutrition
- Severity determined based on phenotypic criteria

Cederholm et al. Clin Nutr 2019

The GLIM concept of malnutrition

Diagnosis of malnutrition requires at least

- **1 Phenotypic criterion and**
- **1 Etiologic criterion**

Phenotypic Criteria			Etiologic Criteria	
Weight loss (%)	*Low BMI (kg/m²)*	*Reduced muscle mass*	*Decreased food intake or malabsorption*	*Inflammation*
>5% within past 6 months or >10% beyond 6 months	<20 if <70 years or <22 if >70 years Asia: <18.5 if <70 yrs or <20 if >70 years	By validated body composition measuring techniques (see EWGSOP2)	<50% of ER >1 week, or any reduction for >2 weeks, or any chronic gastro-intestinal malabsorption	Acute disease/injury or chronic disease-related inflammation

Cederholm et al. Clin Nutr 2019

Severity grading by phenotype

Stage 1 (moderate) and Stage 2 (severe) malnutrition

	Phenotypic Criteria		
	Weight loss (%)	**Low body mass index (kg/m^2)**	**Reduced muscle mass**
Stage 1 Moderate Malnutrition (Requires 1 phenotypic criterion that meets this grade)	5-10% within the past 6 mo, or 10-20% beyond 6 mo	<20 if <70 yr, <22 if ≥70 yr	Mild to moderate deficit (per validated assessment methods)
Stage 2 Severe Malnutrition (Requires 1 phenotypic criterion that meets this grade)	>10% within the past 6 mo, or >20% beyond 6 mo	<18.5 if <70 yr, <20 if ≥70 yr	Severe deficit (per validated assessment methods)

Cederholm et al. Clin Nutr 2019

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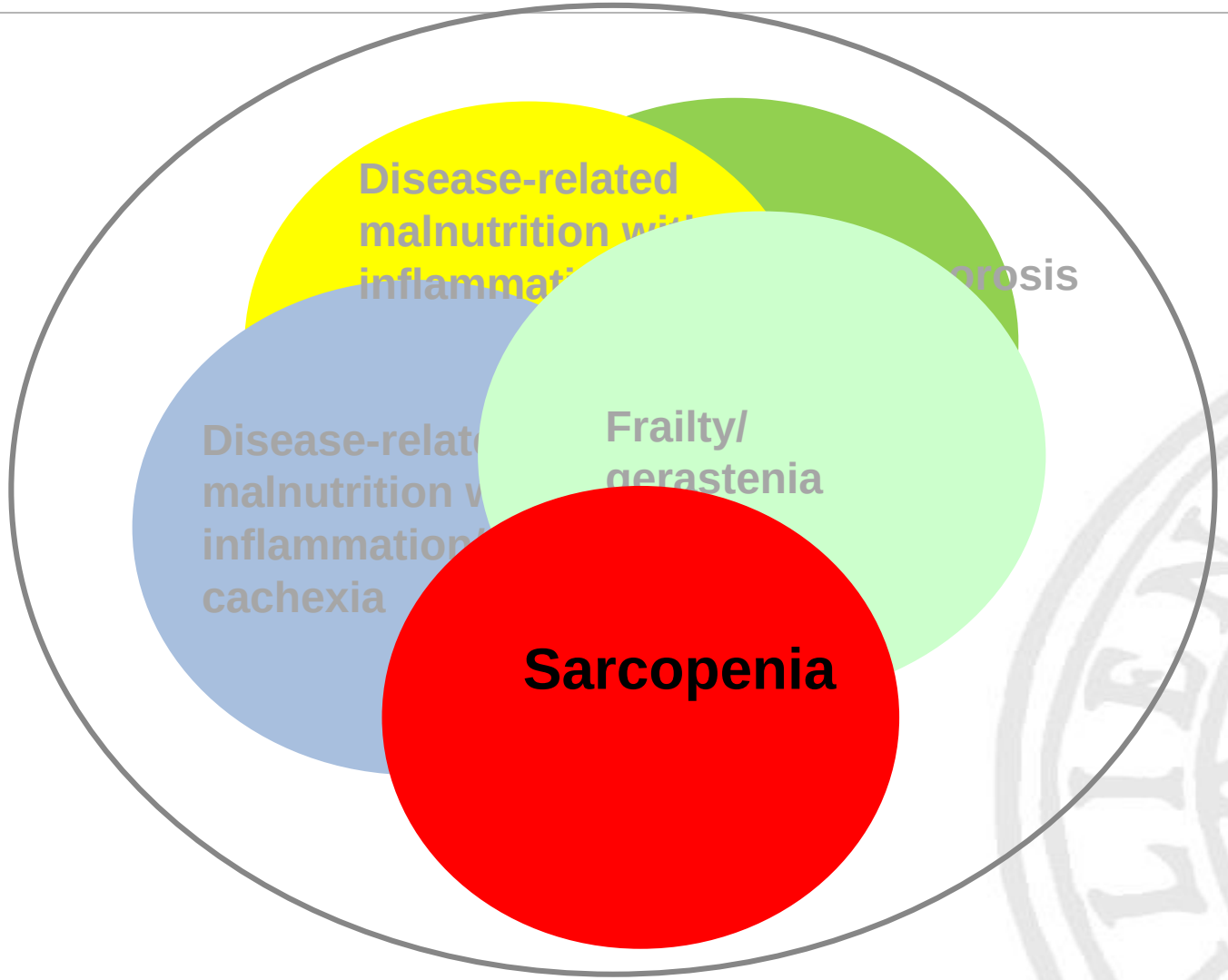
Overlapping catabolic conditions related to reduced function at old age



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Sarcopenia/muscle failure – still an emerging concept

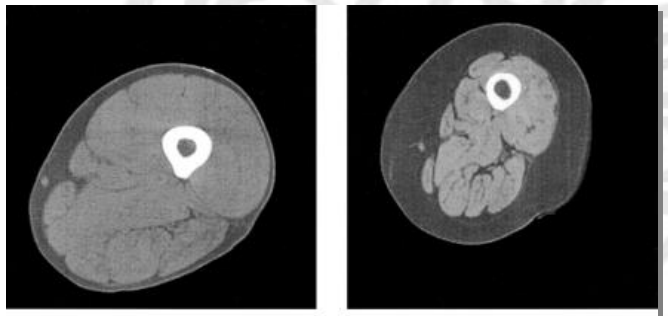
- "Muscle loss steals the freedom of the old„
  Irvin Rosenberg 1989
- **By ICD-10-CM code M62.84 (2016) sarcopenia is defined as a disease**

- Muscle mass decrease by
  - 30-50% from 20 to 80 y
  - 1-2%/y after 50 y
- Selective typ II fibre atrophy
- Muscle strength ↓ by
  - 15%/10 years between 50 and 70 y
  - 30%/10 years >70

Sarcopenia is a syndrome

- **progressive loss of muscle strength and mass**
- **risk of adverse outcomes**

Cruz-Jentoft et al. Age Aging 2010/2018



Young, active Old, sedentary

Diagnostic criteria for sarcopenia/muscle failure

Impaired muscle strength

- Grip strength (kg): 20/16 (w), 30/27 (m) **= Probable sarcopenia**
- Chair rise: 5 sit-to-stands in >15 sec

+

Low muscle mass

- App. skeletal mass index (kg/m^2): <5.5 (w), <7 (m) **= Sarcopenia**
- Fat free mass index (kg/m^2): 15 (w), 17 (m)

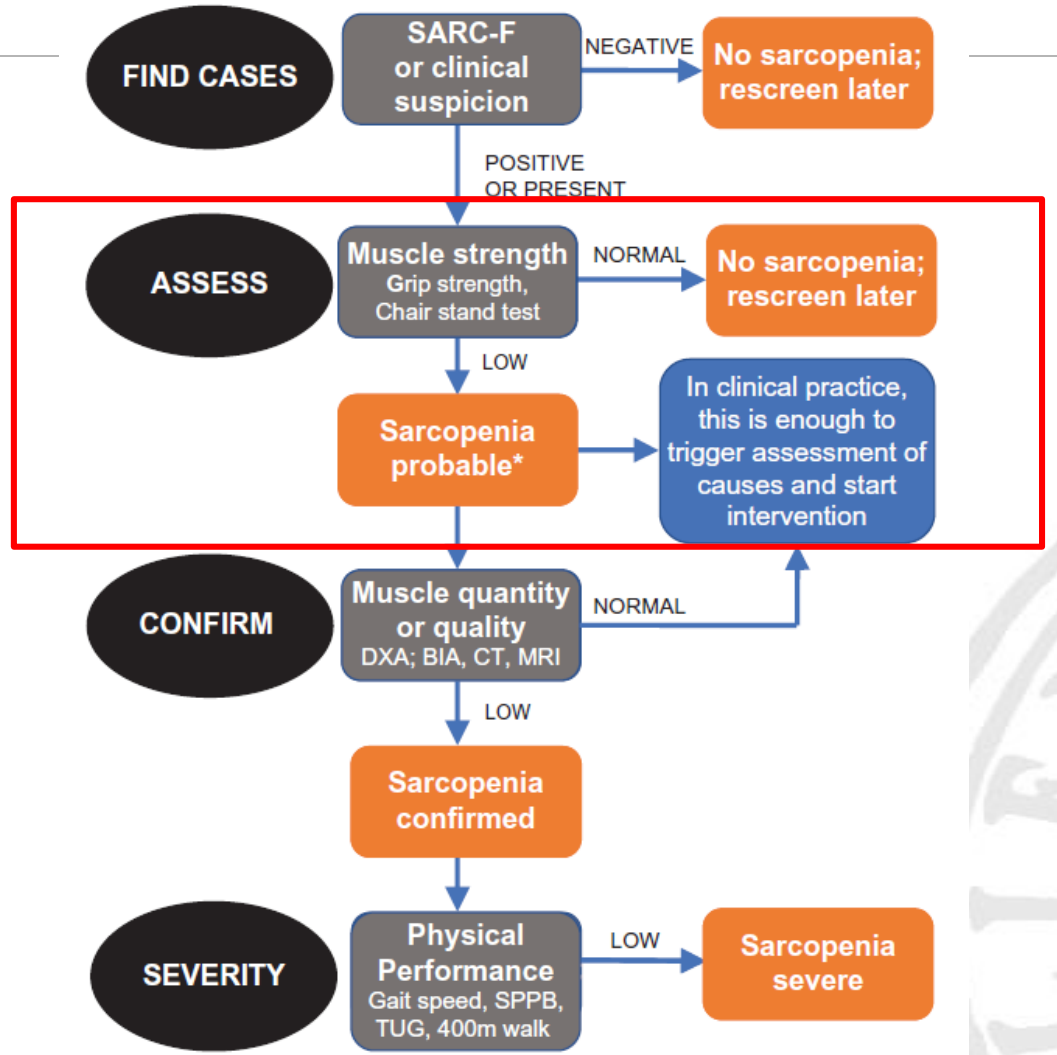
+

Reduced muscle function

- gait speed <0.8 m/s **= Severe sarcopenia**

EWGSOP2: Cruz-Jentoft et al. Age&Ageing 2019

The EWGSOP2 algorithm for case-finding

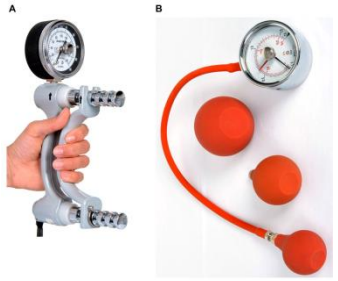


EWGSOP2: Cruz-Jentoft et al. Age Ageing 2019

Measuring muscle strength, function and mass in clinical practice?

- Hand grip
  - Jamar Handdynamometer
  - Martin Vigorimeter?
- Chair rising
  - Time for 5 stand-ups
  - No. in 30 sec
- Stair climb test
- Walking speed
  - 4-10 m
  - Timed-up-go

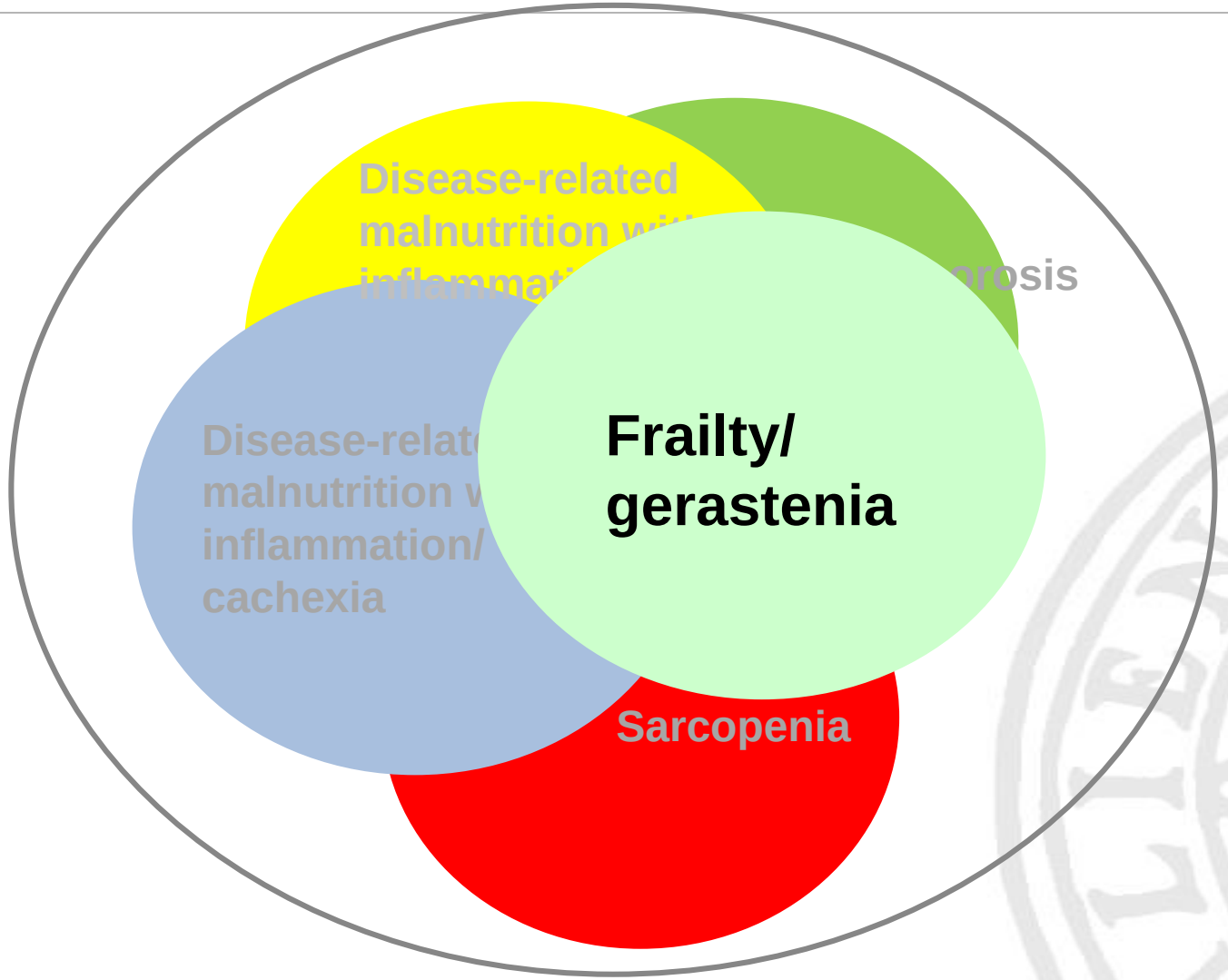
- DEXA
- Bioelectric Impedance Analysis (BIA)
- Anthropometry
- CT?, MRI?, US?



The role of muscle

- ~40% of body weight
- 50-75% of body protein
- Mobility
- Strength
- Amino acid pool
- Glucose regulation
- Energy metabolism
- Endocrine functions
- ....

Overlapping catabolic conditions related to reduced function at old age



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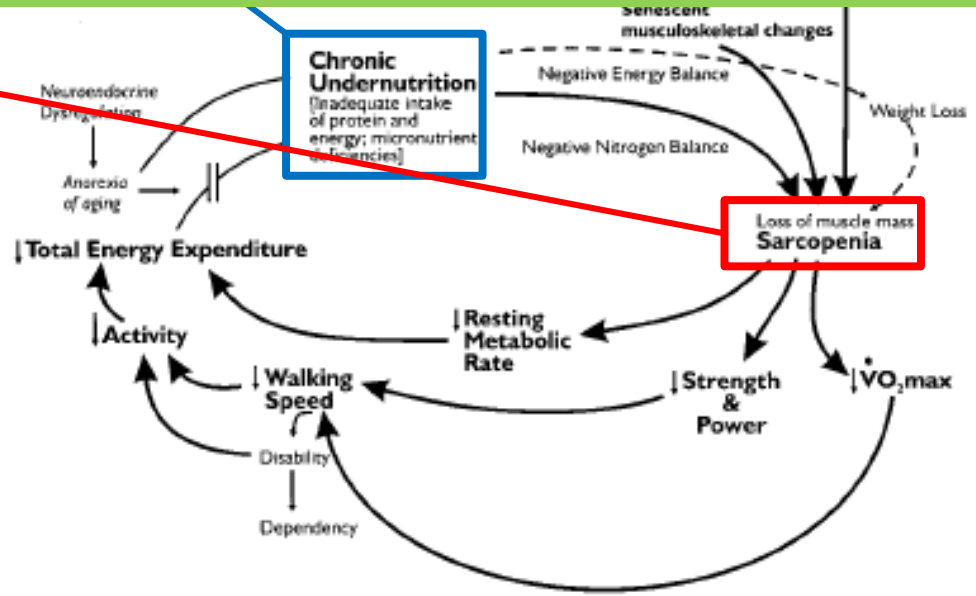
Q: What is frailty?

Linda Fried's criteria (2001)

- **Weight loss**
- **Weakness**
- **Exhaustion**
- **Slowness**
- **Low physical activity**

Frailty is a state of vulnerability and reduced intrinsic capacity that affects older adults' ability to cope with adverse events (WHO).

R: A combination of mal-nutrition and sarcopenia



Fried L et al. Frailty in older adults: evidence for a phenotype. J Gerontol 2001

Frailty is reversible – The SHARE Study

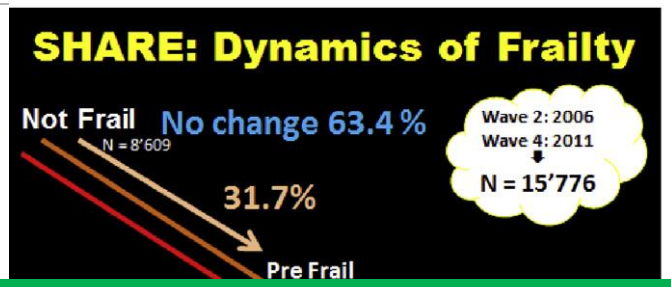
The SHARE Study:

- 80 000 >65 y

Nutrition and exercise are the major treatment options for age-related catabolic conditions

A: Not Frail
B: Pre Frail
C. Frail (40% improved)

A



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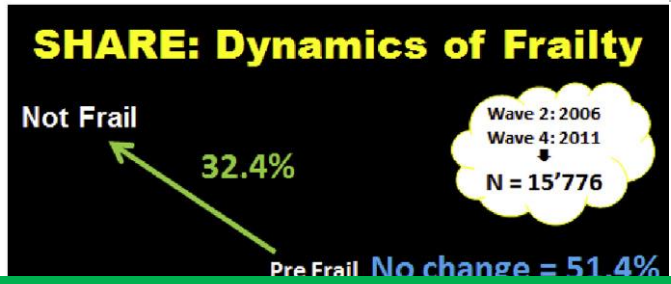
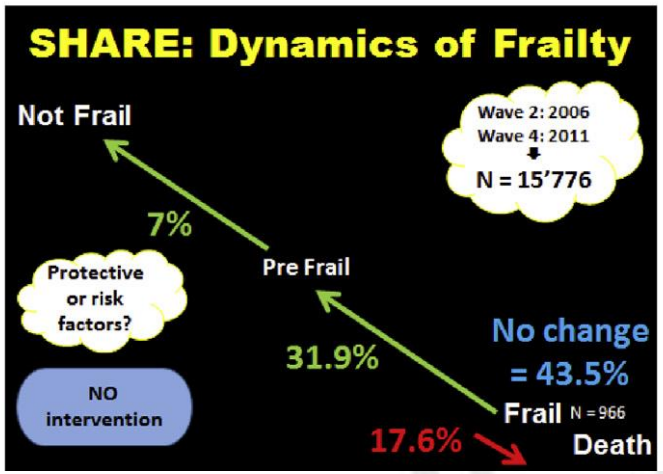


C



Santos-Eggimann B et al, J Gerontol A Biol Sci Med Sci 2009

Treatment options for malnutrition, sarcopenia and physical frailty

✓Nutrition

- Regular food
- *Oral supplementation*
- Energy enriched
- Protein enriched
  - Essential amino acids
- Vitamin D
- Essential fatty acids
- *Dietary patterns*
- *Enteral nutrition*
- Nasogastric tube
- PEG
- *Parenteral nutrition*

✓Anabolic treatment

- BCAA, leucin, HMB
- GH, Nandrolon,
- SARMs

✓Reduce catabolism

- Myostatin inhibitors - decoy receptors
- Ghrelin agonists - anamorelin
- Megesterol acetate
- Proteasome inhibitors
- ACE inhibitors

✓Immuno modulation

- n-3 and n-6 fatty acids
- Arginine, glutamine
- Anti-oxidants

✓ Physical activity

Resistance training

ESPEN guideline on clinical nutrition and hydration in geriatrics

48 recommendations on nutritional therapy

- Education, counselling by dietician
- Mealtime assistance, home-like environment, share mealtime
- Fortified food, snacks, finger-food, texture modification
- ONS: 400 kcal/d, 30 g prot/d; >1 month
- EN: start without delay, <4 w by NG tube, >4 w PEG
- Combine with physical activity
- Hip fracture: Always offer ONS (NOT overnight EN)
- Delirium (prevention), depression, pressure ulcer (healing),
- Obesity: Avoid weigt loss if not indicated, if WL also PA
- Diabetes mellitus: Avoid restrictive diets.

Volkert et al et al. Clin Nutr 2018

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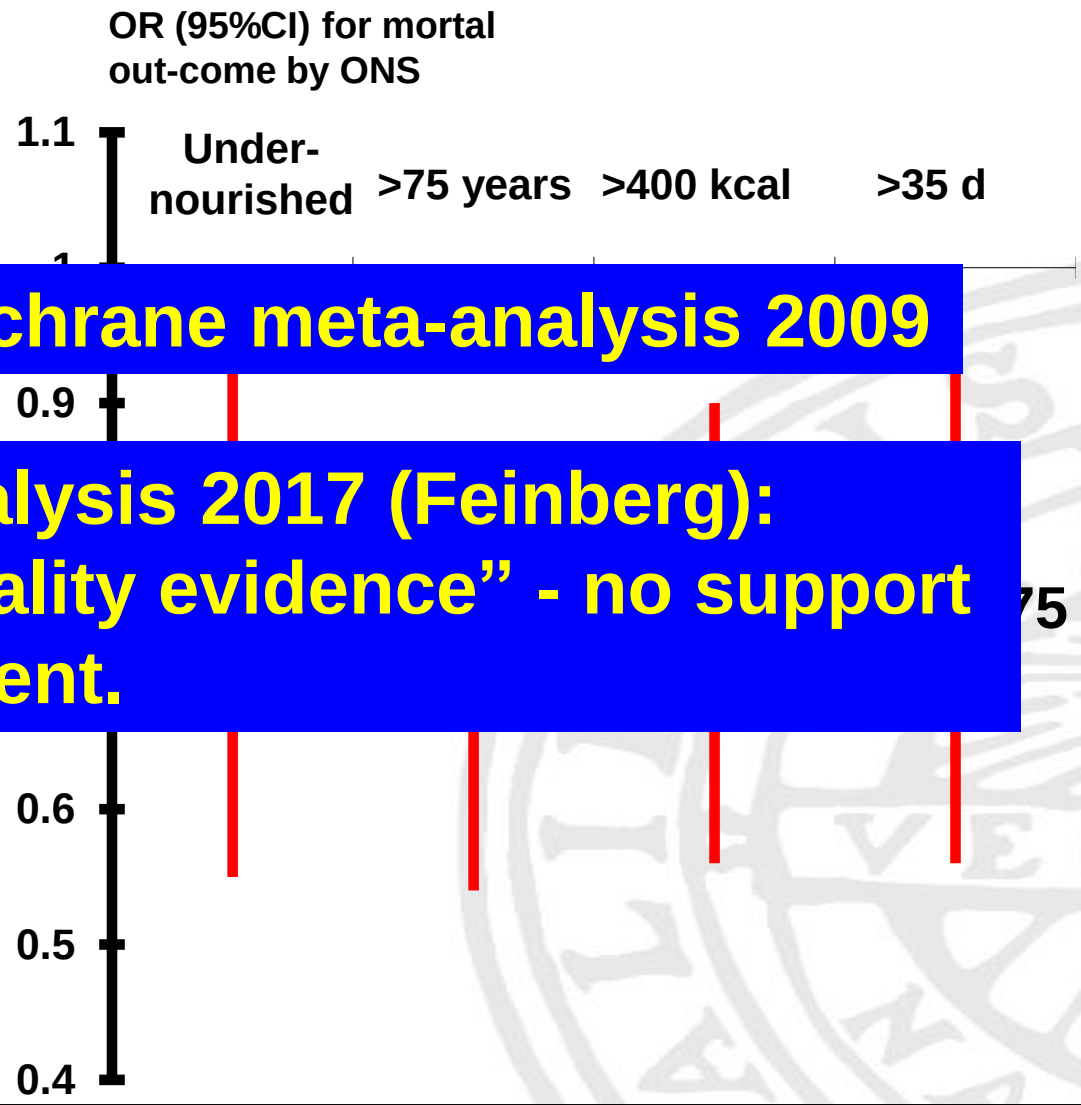
Oral supplementation in older people – Meta-analysis on mortality by subgroup

55 trials/9216 randomized subjects:

- **Undernourished**
- **Age** >75 years
- >
- >

–30 trials/2000 subjects

Milne, AC et al. Ann Intern Med 2006

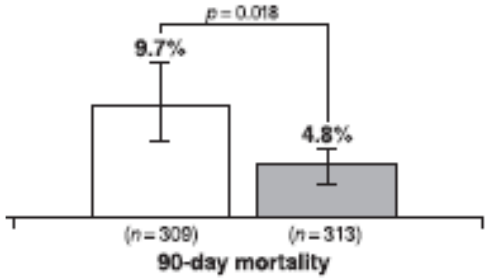


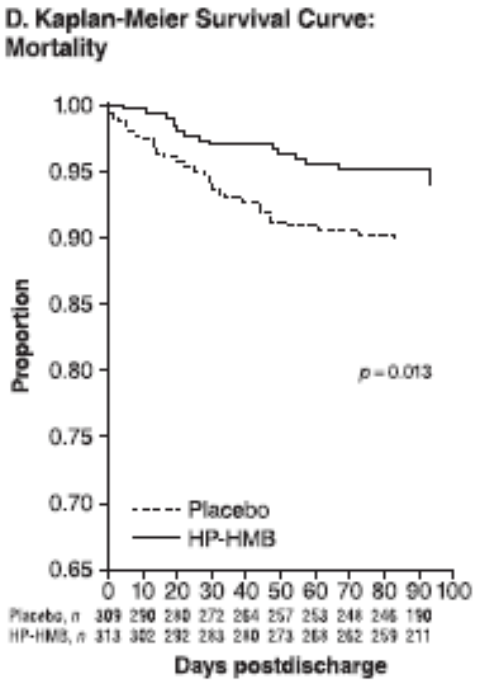
Confirmed by a Cochrane meta-analysis 2009

Cochrane meta-analysis 2017 (Feinberg): 244 trials: ”Low quality evidence” - no support for nutrition treatment.

Energy and protein supplement in hospitalized patients – The Nourish Study

- 652 hospitalized patients, >65 y
- Heart failure, COPD, Pneumonia, …
- Malnourished - many likely also sarcopenic
- 350 kcal, 20 g prot, 160 IU D-vitamin, 1.5 g HMB x2/placebo
- 90 days





Conclusion:

Mortality down by half after three months of ONS treatment; from ~10% till ~5%

Deutz et al. Clin Nutr 2016

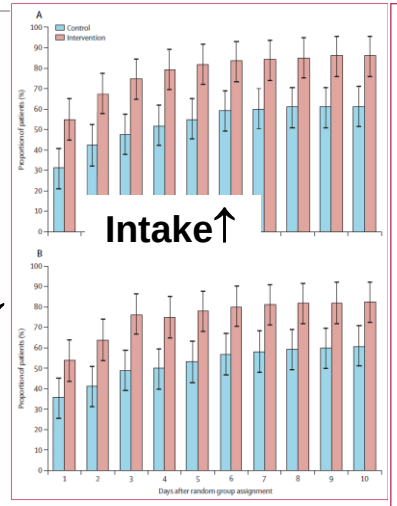
Individualised nutritional support to medical in-patients: The EFFORT Trial

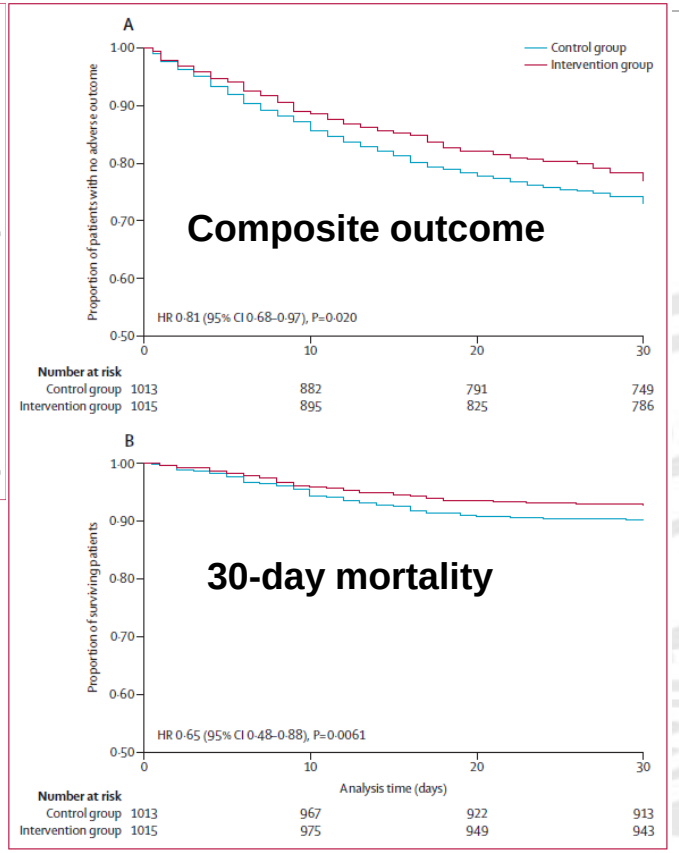
2088 malnourishd in-patients; >50% >75 y

Infection, cancer, CVD,…

RCT: Pragmatic, individualised care plans by dietitians vs. standard

Outcome: Composite †, re-adm, function↓ by Barthel over 30 days





Conclusion

Dietitian defined nutrtional care plans to older in-medical patients improved the composite 30-day clinical outcome; i.e.,

- **Mortality↓**
- **Readmissions↓**
- **Functionality↑**

Schuetz et al. Lancet 2019

Individualised nutritional support to medical in-patients: The EFFORT Trial

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Ou

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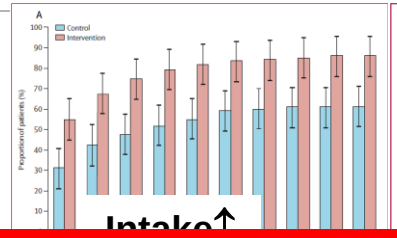
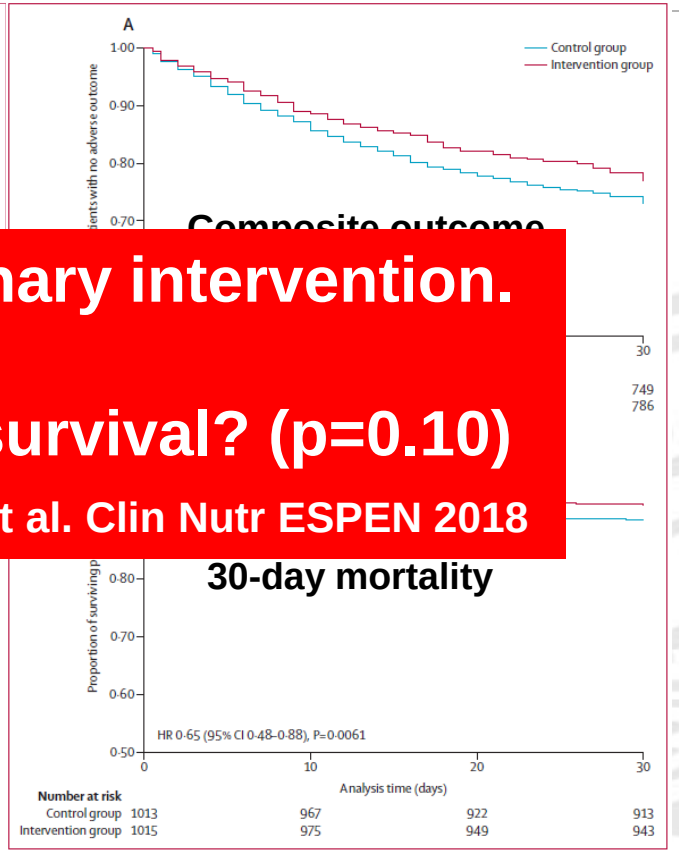




Systematic review on multidisciplinary intervention.
5 studies, 600 patients
Improved QoL (p<0.01), improved survival? (p=0.10)

Rasmussen et al. Clin Nutr ESPEN 2018

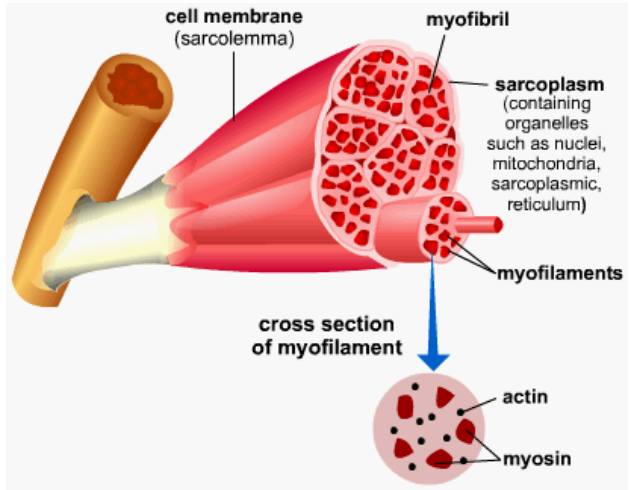
Dietitian defined nutritional care plans to older in-medical patients improved the composite 30-day clinical outcome; i.e.,

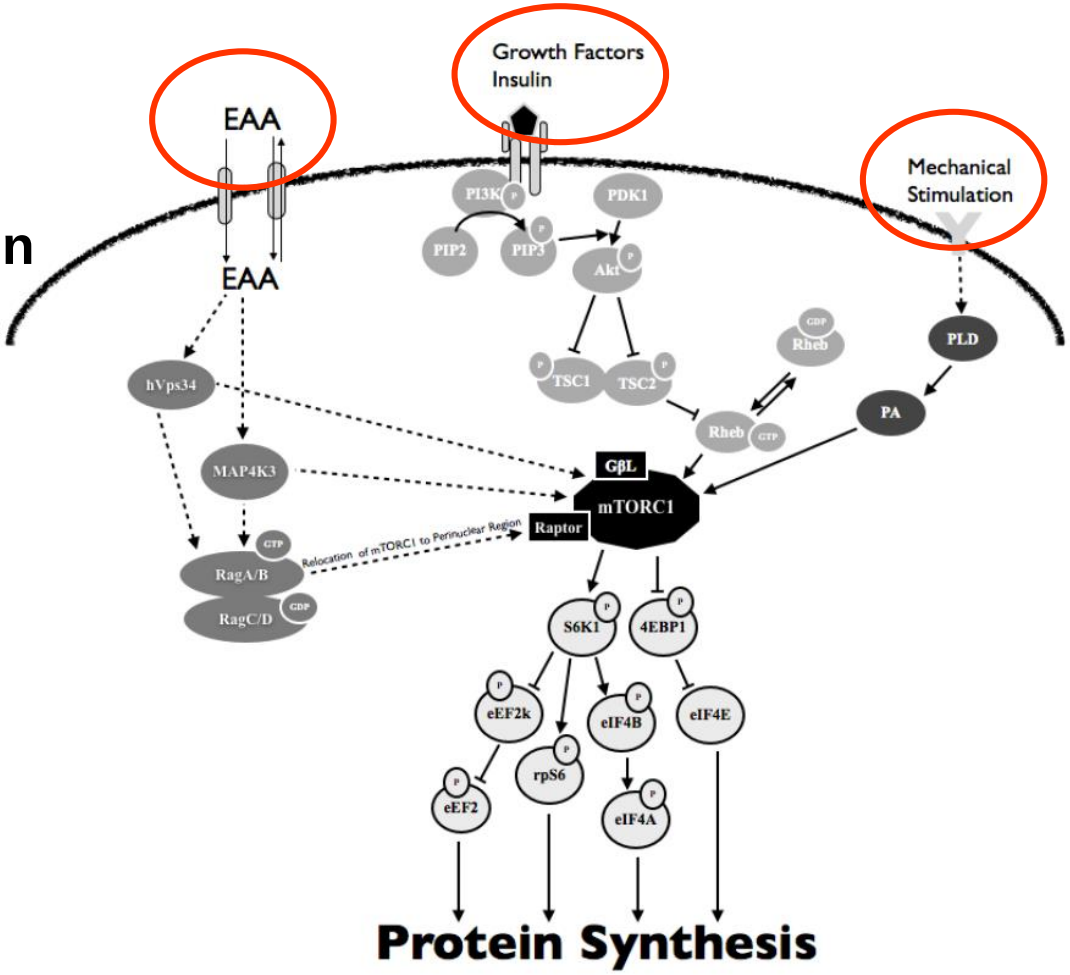
- **Mortality↓**
- **Readmissions↓**
- **Functionality↑**

Schuetz et al. Lancet 2019

How to generate protein synthesis?

- **mTOR activation**
  - **Amino acids**
  - **Mechanical stimulation**
  - **Anabolic hormones**
- **Transcription**
- **Translation**





Walker et al. Med Sci Sports Exerc 2011;43

Protein intake and mobility limitation in the Health ABC Study

1998 ♀/♂, 70-79 y com-dw

- **6-year follow-up**
- **Tertiles of protein intake (FFQ)**
- **Limited walking (400 m) or stair climbing (10 steps)**
- **1/3 developed mobility lim**

T1 – <0.7 g/kg bw/d
T2 – 0.7-1.0 g/kg bw/d
T3 – >1 g/kg bw/d

T1 vs T3: HR 1.89 (CI 1.41-2.44)
T2 vs T3: HR 1.49 (CI 1.20-1.84)
to develop mobility limitation when compared to >1 g prot/kg bw/d

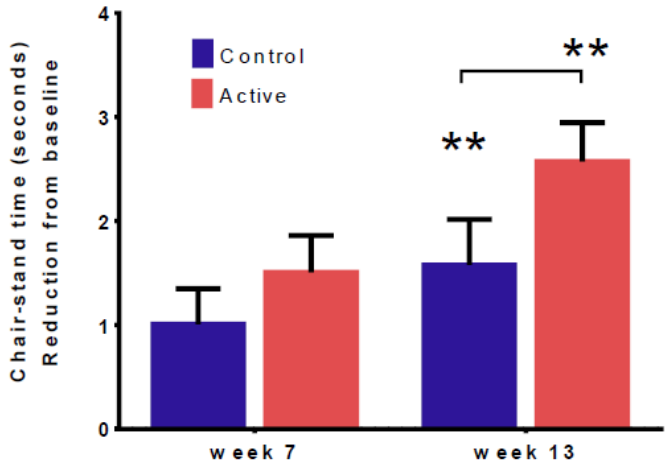
Conclusion:
Protein intake >1 g/kg bw/d reduces 6-y risk of mobility limitation

Houston DK et al. JAGS 2017

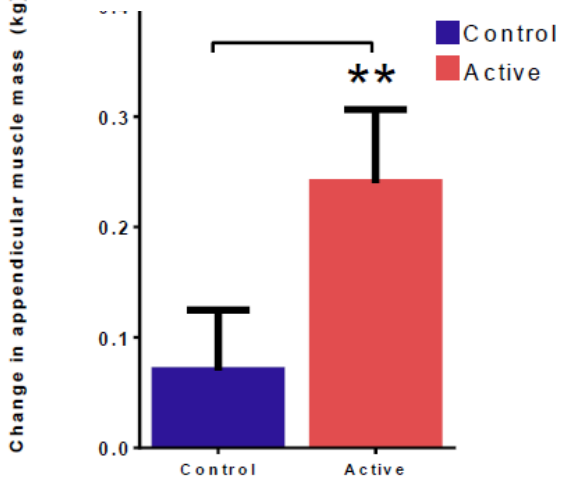
Protein + leucin + vitamin D to *sarcopenic non-malnourished* older adults: The Provide Study

- 380 >65 y, 77±1 y, sarcopenic, non-malnourished,
- RCT for 13 weeks
- 40 g prot, 3 g leucin, 1600 IU vit D, 300 kcal vs. isocaloric placebo
- Primary outcomes: SPPB, HGS,
- Secondary outcomes: Chair-stand, DXA

Chair-stand



App muscle mass



Conclusion:

- Faster 5 times chair stand
- Gains in appendicular muscle mass

Bauer et al. JAMDA 2015

Older Person Exercise and Nutrition Study: The OPEN Study

100 NH res, >75 y (mean 86 y), BMI<30

RCT: 12 weeks

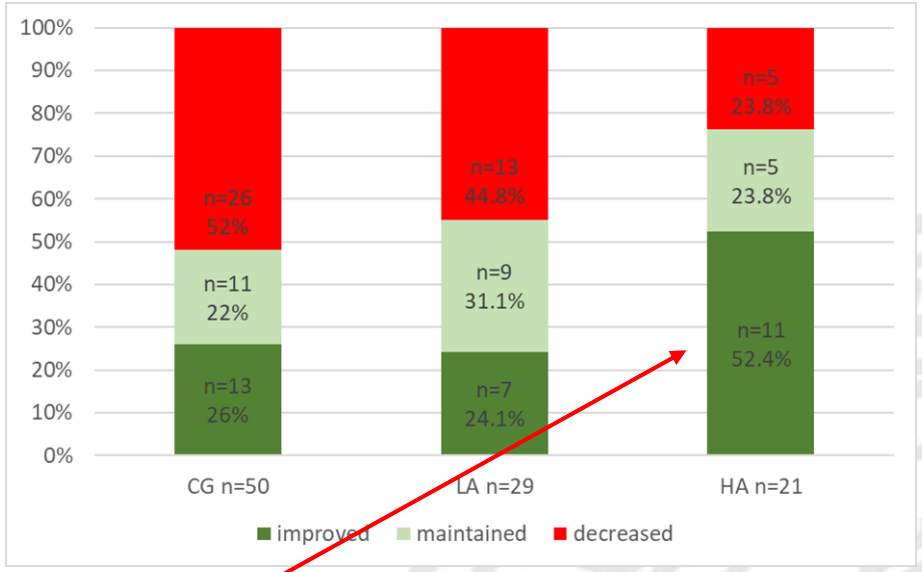
Intervention:

- **Sit-to-stand x4/d**
- **Protein drink x2/d**

Control: Usual care

Outcome:

- **Chair-rise 30 sec**
- **Gait speed**
- **Balance, ADL, etc**



Conclusions

High adherence to sit-to-stand exercise + ONS improved chair-rise capacity and gait speed in old nursing home residents

Grönstedt et al. Submitted

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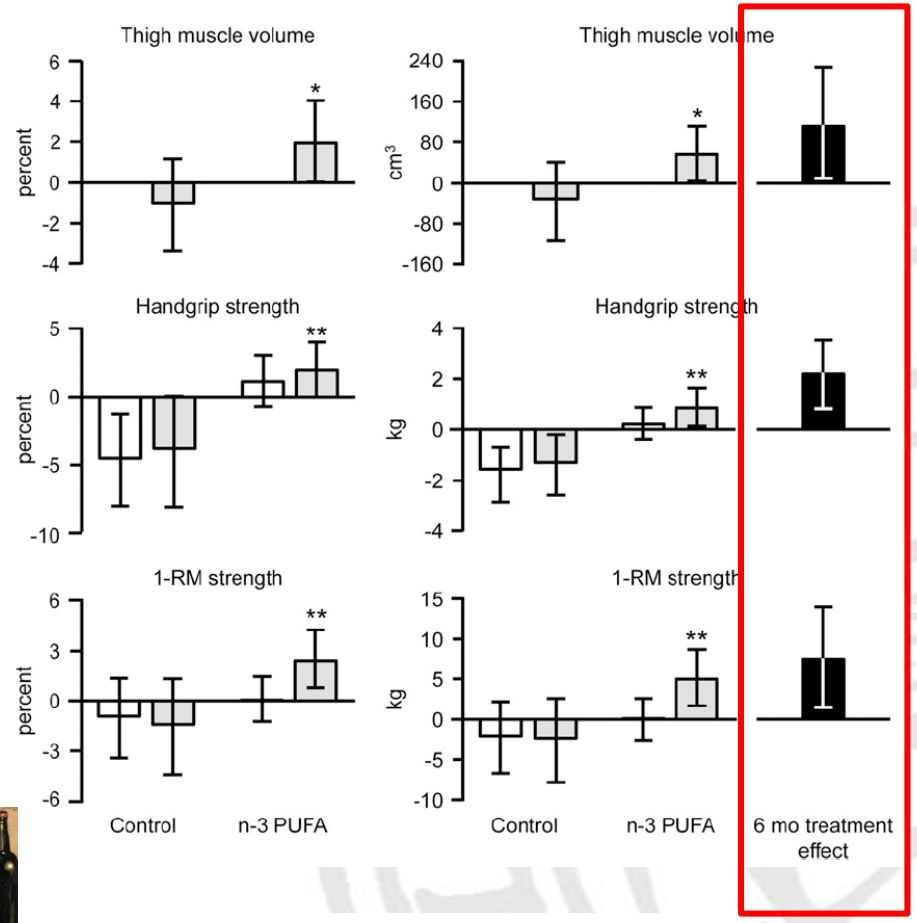
Other nutrients

- Fat quality?
- Vitamin D?
- Healthy - Mediterranean like diet?

N-3 fatty acids may improve muscle mass and function in healthy old adults

- 60 healthy, 60-85 y
- 6 months RCT,
  - N-3 fatty acids – 3.3 g/d
  - Linoleic acid (C)
- Outcome;
  - Thigh volume,
  - Grip strength,
  - 1-RM strength

Treatment effect

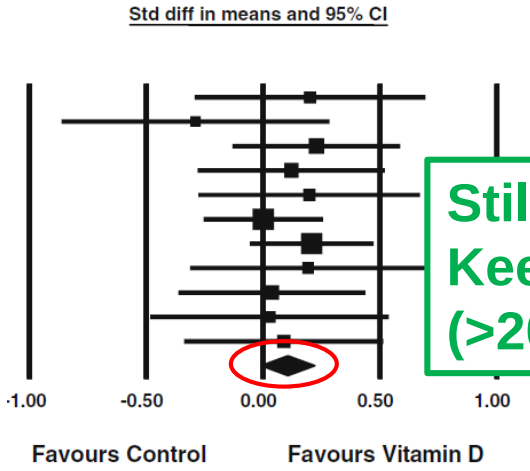


Conclusion:
6-mo treatment with n-3 FA increased muscle mass and improved muscle strength in healthy old adults

Smith et al. AJCN 2015

Vitamin D supplementation and muscle – 3 meta-analyses 2011-2017

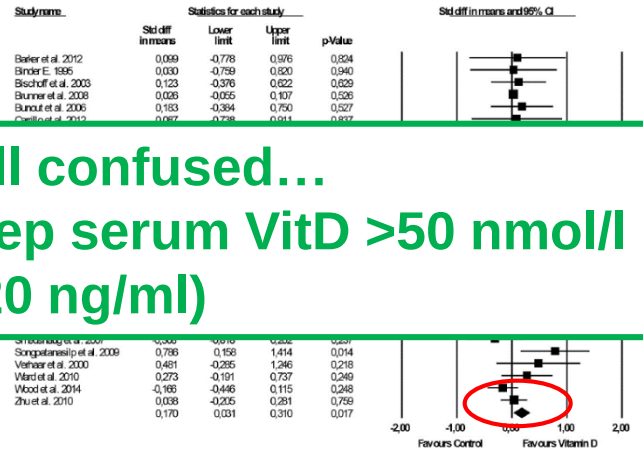
Meta-analysis: 17 RCT
- Quadriceps strength



Results: Overall no effect, but in 2 studies w. Vit D <25 nmol/l Vit D suppl. resulted in improved leg strength

Stockton et al. Osteopor Int 2011

Meta-analysis: 30 RCT
- Stand. Mean Diff of various strength tests

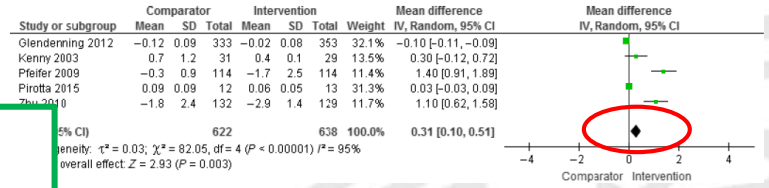


Results: A small significant effect on global muscle strength, but no effects on muscle mass or power

Beaudart et al. J Clin Endocrnol Metab 2014

Still confused…
Keep serum VitD >50 nmol/l (>20 ng/ml)

Meta-analysis: 15 RCT
- Hand grip strength
- Timed up and go (TUG)



Results: No effect on HGS, and indications of deteriorated TUG

Rosendahl-Riise et al. JHND 2017

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High adherence to a Mediterranean-like diet is associated with reduced risk of frailty – prospective studies

690 com-dw adults >65y (inChianti Study), Italy

- FFQ (EPIC), MDS low/med/high adherence
- 6-year follow-up
- High adherer
reduced risk

1815 comm-dw old adults (>60y), Spain

- FFQ; MEDAS and MDS/tertiles

ame frail acc.

0.48 (95%CI
uced risk, to
d to MDS T1.

1104 70 y old Swedish men (ULSAM)

369 alive 16 years later; 75% were independent

Factors related to "Independent ageing":

- **Mediterranean-like diet; OR 2.69 (CI 1.14-6.8)**
- **Never-smoking; OR 2.20 (CI 1.05-4.60)**
- **Obesity; OR 0.37 (CI 0.17-0.0.80**

Franzon K et al. JAGS 2017

Mechanisms through reduced inflammation and oxidation?

Frailty and its components		
MDS score		
Feeling of exhaustion		
Low		
Medium		
High		
Low physical activity		
Low		
Medium		
High		
Poor muscle strength		
Low		
Medium		
High		
Low walking speed		
Low		
Medium		
High		
Frailty		
Low	1.00	1.00
Medium	0.60 (0.34, 1.06)	0.71 (0.42, 1.21)
High	0.26 (0.11, 0.59)	0.30 (0.14, 0.66)

Talegawkar et al. J Nutr 2012;142:2161-6

	Tertile 3	*P* Trend
	OR (95% CI)	
	34	
Rel.	0.43 (0.27–0.67)†	<.001
	0.48 (0.30–0.77)†	.002

Leon-Munoz et al. JAMDA 2014;15:899-903

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Treatment of malnutrition, sarcopenia and frailty/gerastenia in old adults

Screen for malnutrition/sarcopenia

- Diagnosis of malnutrition acc. to GLIM criteria

Nutrition therapy

- Energy intake (incl. supplementation)
  - 30 kcal/kg bw/d - individualize
- Protein and amino acid intake (incl. supplementation)
  - Target 1.0-1.5 g/kg bw/d - individualize
- Other nutrients
  - Vitamin D supplementation
    - Target serum concentration to exceed 50 nmol/
  - Essential fatty acids supplementation – n-3,
- Healthy food patterns – basic food intake
  - Traditional Mediterranean, Traditional Asian

Thanks!

Exercise

Combine nutritional therapy with physical activity
Add resistance training (3 t/w) to the regular daily aerobic activities