

# Programme 22/03/2024 ULB

## **9h00-10h30 : Nutrition and hydration in Geriatrics – Dr Sandra De Breucker**

- Updated ESPEN guidelines : what's new?
- Principles of a good hydration in geriatric clinical practice
- The refeeding syndrome : think about it!

## **10h45-12h15 : The geriatric patient in emergencies**

- What is a geriatric emergency? – Dr Sandra De Breucker
- The polytrauma geriatric patient – Dr Laetitia Beernaert
- Collaboration between geriatricians and urgentists: the urgentist's point of view – Dr Mathieu Ghesquière

# Nutrition and Hydration in Geriatrics

Updated ESPEN guidelines : what's new?

Principles of a good hydration in geriatric clinical practice

# Why do we care for nutrition in geriatrics?

"According to current estimates, around a quarter of elderly people (aged 65 and over) suffer from malnutrition or are at risk of malnutrition. This figure is expected to increase as the population ages rapidly. The United Nations predicts that between 2019 and 2050, the population of adults aged 65 and over will double in many regions".



Leij-Halfwerk S, et al. *Maturitas* 2019; **126**: 80–89.

United Nations Department of Economic and Social Affairs Population Division. World population prospects 2019.

<https://population.un.org/wpp>

# Why do we care for nutrition in geriatrics?

"In the event of weight loss in an elderly person, **functional recovery** is unlikely due to the loss of skeletal muscle mass, even with optimal nutritional support.

The negative consequences of undernutrition include **frailty, delirium, reduced immunocompetence, muscle wasting, hypothermia, osteoporosis, mood disorders, cognitive impairment, reduced quality of life and premature mortality**, whatever the cause of death.

Delayed treatment of undernutrition can lead to **poor wound healing, pressure sores, falls, hospitalisation and institutionalisation**.

Many chronic diseases are exacerbated by malnutrition, and the condition is also associated with **high healthcare costs.**"

# Why do we care for nutrition in geriatrics?

	Risk factor for malnutrition	Strength of evidence
Eating problems (low appetite and eating dependency)	Yes	Moderate
Low physical function (ADL, performance, or strength)	Yes	Moderate
Poor self-perceived health	Yes	Moderate
Admission to hospital	Yes	Moderate
Oral health (low number of teeth or pairs of teeth) <sup>49*</sup>	Yes	Low
Loss of interest in life	Yes	Low
Marital status (unmarried, divorced, or separated) <sup>47</sup>	Yes	Low
Lifestyle factors (smoking, alcohol, and low physical activity)	No	Moderate
Psychological factors (distress and anxiety)	No	Low
Socioeconomic factors (access to transport, wellbeing, and loneliness)	No	Low
Polypharmacy and medicine intake	Undetermined	Conflicting evidence
Dysphagia	Undetermined	Conflicting evidence
Cognitive decline	Undetermined	Conflicting evidence
Depression	Undetermined	Conflicting evidence
Constipation	Undetermined	Conflicting evidence

Data are based on evidence from systematic reviews.<sup>10,47,49</sup> The most supportive evidence comes from community-based studies identified by O'Keefe and colleagues,<sup>10</sup> unless otherwise indicated. Strength of evidence is graded as: strong (consistent findings, with >75% of studies showing the same direction of effect in multiple high-quality studies); moderate (consistent findings in multiple low-quality studies); low (findings from one study of low to moderate quality); and conflicting (inconsistent findings across studies regardless of study quality).<sup>10</sup> ADL=activities of daily living. \*Oral health was not identified as a risk factor for malnutrition by O'Keefe and colleagues;<sup>10</sup> however, the evidence base linking oral health with the development of malnutrition in older adults has since expanded.<sup>49</sup>

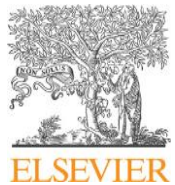
**Table 1: Potentially modifiable risk factors for malnutrition in older adults**

# New causal classification of malnutrition in older people

- Malnutrition linked to inflammatory health conditions
- Malnutrition linked to a non-inflammatory health condition
- Malnutrition not linked to a health condition
- Famine
- Socio-economic factors
- Psychological factors

# ESPEN GUIDELINES 2018

Clinical Nutrition xxx (2018) 1–38



Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: <http://www.elsevier.com/locate/clnu>



ESPEN Guideline

## ESPEN guideline on clinical nutrition and hydration in geriatrics

Dorothee Volkert <sup>a,\*</sup>, Anne Marie Beck <sup>b</sup>, Tommy Cederholm <sup>c</sup>, Alfonso Cruz-Jentoft <sup>d</sup>, Sabine Goisser <sup>e</sup>, Lee Hooper <sup>f</sup>, Eva Kiesswetter <sup>a</sup>, Marcello Maggio <sup>g,h</sup>, Agathe Raynaud-Simon <sup>i</sup>, Cornel C. Sieber <sup>a,j</sup>, Lubos Sobotka <sup>k</sup>, Dieneke van Asselt <sup>l</sup>, Rainer Wirth <sup>m</sup>, Stephan C. Bischoff <sup>n</sup>

**Consensus agreement**

### Grade of recommendation :

**A** : meta-analysis, syst rev, RCT 1++

**B** : 2++, or extrapolated 1++ or 1+

**O** : level 3,4 or extrapolated 2++ or 2+

**GPP** : expert consensus (good practice point)

90-100%

B  
B

B

GPP

# ESPEN GUIDELINES 2022

Clinical Nutrition 41 (2022) 958–989



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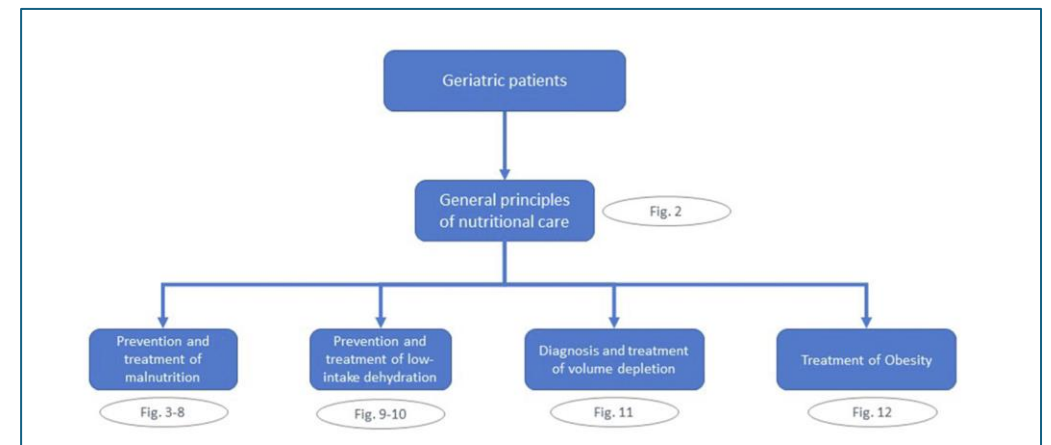
ESPEN Guideline

## ESPEN practical guideline: Clinical nutrition and hydration in geriatrics

Dorothee Volkert <sup>a,\*</sup>, Anne Marie Beck <sup>b</sup>, Tommy Cederholm <sup>c,d</sup>, Alfonso Cruz-Jentoft <sup>e</sup>, Lee Hooper <sup>f</sup>, Eva Kiesswetter <sup>a</sup>, Marcello Maggio <sup>g</sup>, Agathe Raynaud-Simon <sup>h</sup>, Cornel Sieber <sup>a,i</sup>, Lubos Sobotka <sup>j</sup>, Dienneke van Asselt <sup>k</sup>, Rainer Wirth <sup>l</sup>, Stephan C. Bischoff <sup>m</sup>

Focus on hydration

Practical algorithms to go through the reco





# General principles

Recommended nutritional intake:

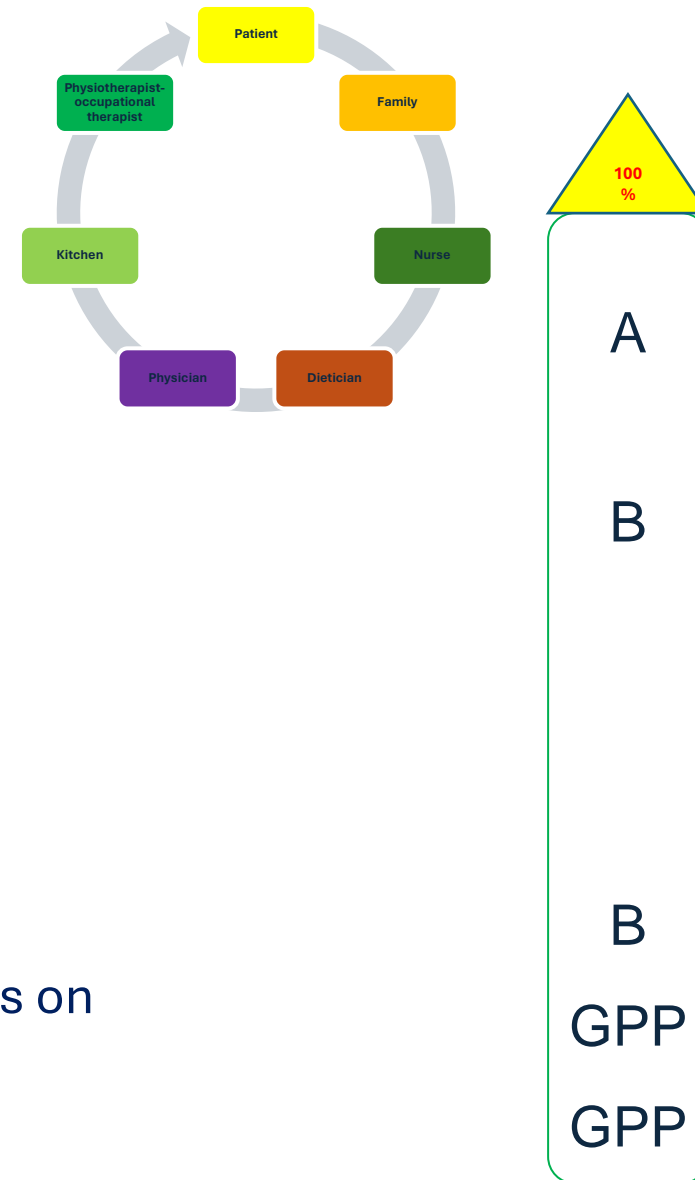
- Calories : 30 kcal/kg/d
- Proteins : min 1g/kg/d
  
- Minerals and vitamins : same amounts than younger people except for calcium (1g/d) and vitamin D (800 UI/d)
- Deficiency must be screened and treated (iron, folates, vit B12, etc.)



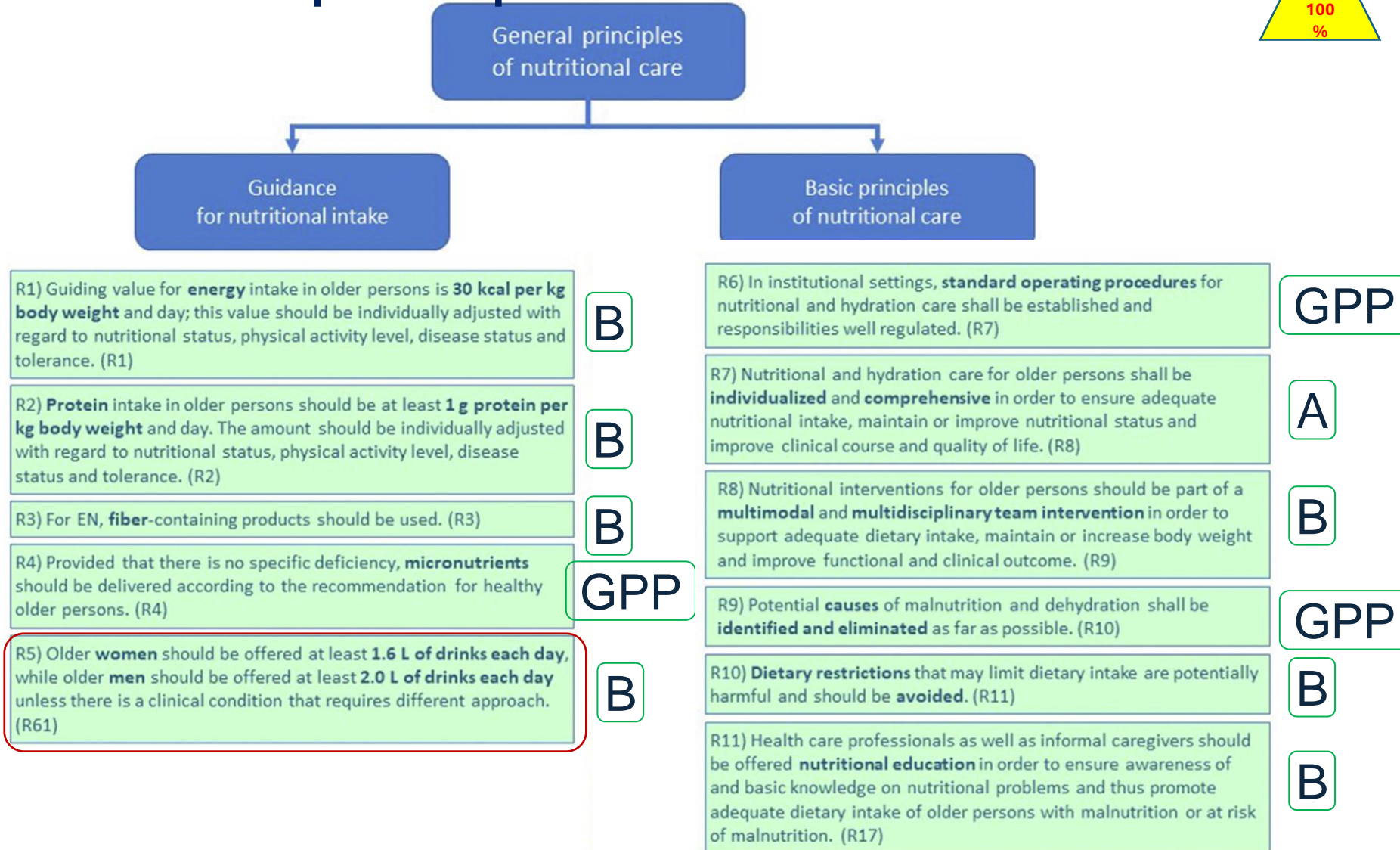
2018

# General principles

- ✓ Patient-centered approach
- ✓ Multidisciplinary approach
  - Dieticians - counseling
  - Enriched meals- collations - ONS
  - Meal assistance for dependent people
  - Adaptation of the environment
  - Look for the indication of enteral / perenteral nutrition
- ✓ Education of healthcare workers and caregivers
- ✓ Multimodal approach for causes and treatment (Meals on Wheels)
- ✓ Avoid restrictive diets



# General principles



# Prevention and treatment

## Screening and assessment

- All older people should be screened for malnutrition
  - At home, in home care facilities, in hospitals, in rehab units, ...
  - Caution to obese patients : could be malnourished!
- In case of positive screening :
  - The patient has to be assessed
  - A nutritional intervention should be directly initiated
  - The nutritional status should be followed up regularly



GPP

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# Assessment : GLIM criteria

## GLIM criteria : 2 steps:

### 1. Identification of risk

- MUST
- MNA-SF

### 2. Assessment

- Phénotypic (min 1)
- Etiological (min 1)
- Severity

Risk screening



Diagnostic Assessment



Diagnosis



Severity Grading

#### At risk for malnutrition

- Use validated screening tools



#### Assessment criteria

- **Phenotypic**
  - Non-volitional weight loss
  - Low body mass index
  - Reduced muscle mass
- **Etiologic**
  - Reduced food intake or assimilation
  - Disease burden/inflammatory condition



#### Meets criteria for malnutrition diagnosis

- Requires at least 1 Phenotypic criterion and 1 Etiologic criterion



#### Determine severity of malnutrition

- Severity determined based on Phenotypic criterion

# Assessment : HAS criteria

HAS criteria HAS :  
1 criterion

Dénutrition :

- ↓ poids  $\geq 5\%$  en 1 mois ou  $\geq 10\%$  en 6 mois
- IMC  $< 21 \text{ kg/m}^2$
- Albuminémie  $< 35 \text{ g/l}$
- MNA  $< 17/30$

Dénutrition sévère :

- ↓ poids  $\geq 10\%$  en 1 mois ou  $\geq 15\%$  en 6 mois
- IMC  $< 18 \text{ kg/m}^2$
- Albuminémie  $< 30 \text{ g/l}$

HAS criteria 2021 :  
Based on GLIM criteria

Diagnostic de dénutrition		
$\geq 1$ critère phénotypique	✚ $\geq 1$ critère étiologique	Sévérité
Perte de poids : <ul style="list-style-type: none"> <li>- <math>\geq 5\%</math> en 1 mois</li> <li>- ou <math>\geq 10\%</math> en 6 mois</li> <li>- ou <math>\geq 10\%</math> par rapport au poids habituel avant le début de la maladie</li> </ul>	Réduction de la prise alimentaire $\geq 50\%$ pendant plus d'1 semaine, ou toute réduction des apports pendant plus de 2 semaines par rapport : <ul style="list-style-type: none"> <li>- à la consommation alimentaire habituelle</li> <li>- ou aux besoins protéino-énergétiques</li> </ul>	Perte de poids : <ul style="list-style-type: none"> <li>- <math>\geq 10\%</math> en 1 mois</li> <li>- ou <math>\geq 15\%</math> en 6 mois</li> <li>- ou <math>\geq 15\%</math> par rapport au poids habituel avant le début de la maladie</li> </ul>
IMC $< 22 \text{ kg/m}^2$	Absorption réduite (malabsorption/maldigestion)	IMC $< 20 \text{ kg/m}^2$
Sarcopénie confirmée	Situation d'agression (avec ou sans syndrome inflammatoire) : <ul style="list-style-type: none"> <li>- pathologie aiguë</li> <li>- ou pathologie chronique</li> <li>- ou pathologie maligne évolutive</li> </ul>	Albuminémie $\leq 30 \text{ g/L}$

# Look for potential causes of loss of appetite

## THE MEALS-ON-WHEELS APPROACH

MEDICATIONS > 5

EMOTIONAL PROBLEMS (DEPRESSION)

ANOREXIA NERVOSA (TARDIVE) AND ABNORMAL ATTITUDES TO FOOD

LATE LIFE PARANOIA

SWALLOWING PROBLEMS

ORAL PROBLEMS

NO MONEY

WANDERING AND OTHER DEMENTIA-BEHAVIORS, DELIRIUM

HYPERTHYROIDISM, HYPERPARATHYROIDISM

ENTRY PROBLEMS (MALABSORPTION)

EATING PROBLEMS (PHYSICAL AND COGNITIVE)

LOW SALT, LOW CHOLESTEROL DIETS

SHOPPING (FOOD AVAILABILITY)

# Prevention and treatment

- Offer assistance for meals to dependent people :
  - At home
  - In nursing home
- A pleasant home-like environment influences positively the amount on intake and the quality of life of older malnourished people in nursing home.
- Older people should be encouraged to share their mealtime with others.
- Offer Meals on Wheels services for community dwelling older people



GPP  
A  
A

GPP

B

B





# Recommendations for OP at risk of malnutrition and for malnourished OP

## Exercise

- OP should be encouraged to be physically active in order to maintain or to improve general health and muscle mass.
- An adequate amount of proteins and calories should be provided during physical activity periods.

100  
%

GPP

B



# Recommendations for OP at risk of malnutrition and for malnourished OP

- Individualisation of nutritional management;
- By a trained dietician: at least 2 sessions + telephone call + written advice - at least 12 weeks of follow-up.
- Enrich the diet with natural products (eggs, cream, butter, oil, cheese) or specific preparations (protein powder, maltodextrin).
- Provide finger food snacks between meals.
- Adapt textures if swallowing or chewing problems.

90-  
100  
%

B

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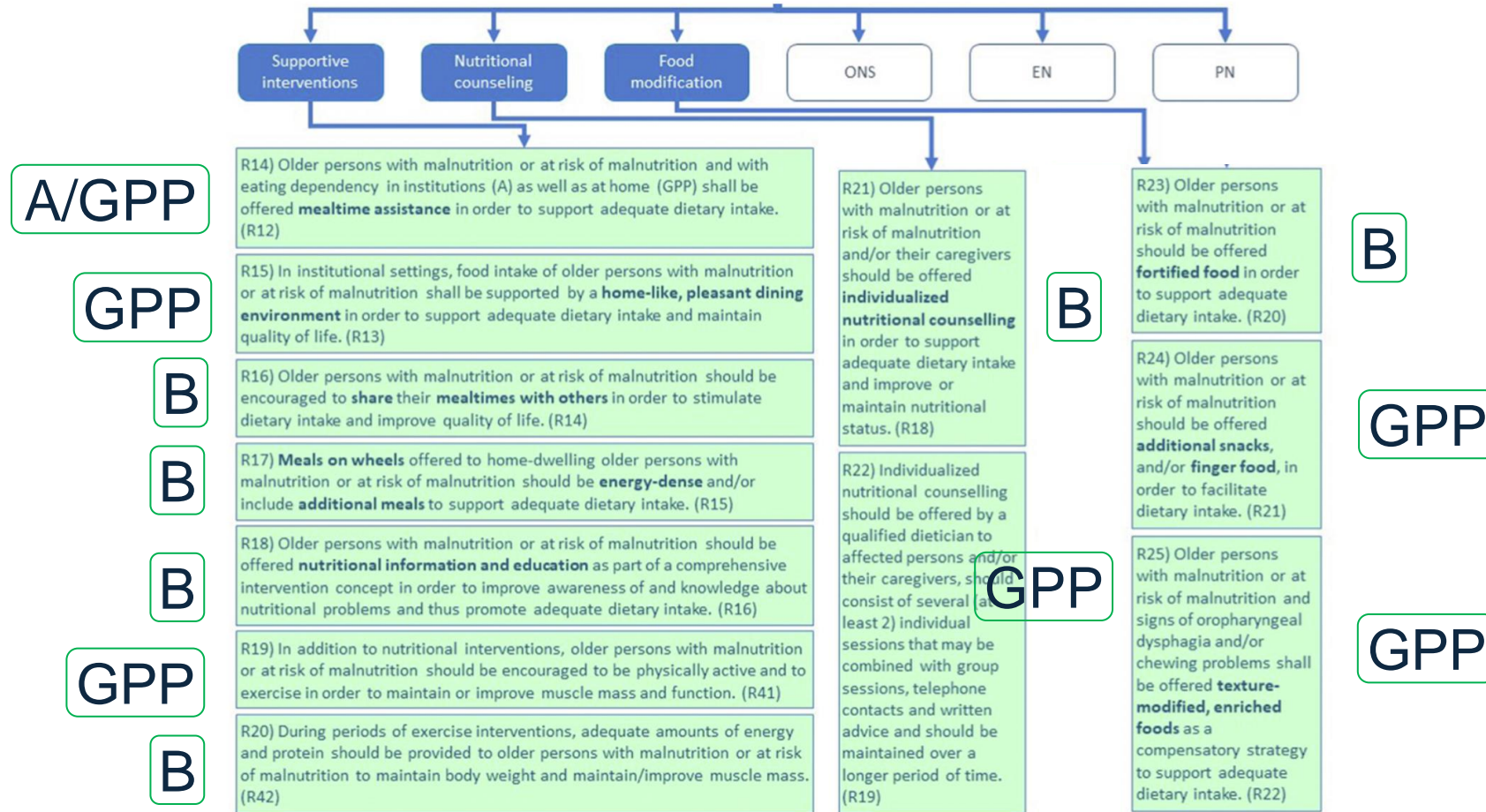
B

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# Prevention and treatment of malnutrition



# Prevention and treatment of malnutrition

## Oral nutritional supplements

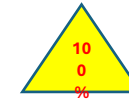
Patients who are undernourished or at risk of undernutrition with chronic co-morbidities and whose enriched intakes are insufficient

Patients in hospital at risk of malnutrition or who are malnourished

Min 400 kcal/day + min 30 g protein, outside meals

Minimum duration 1 month

Monitor weight 1x per week



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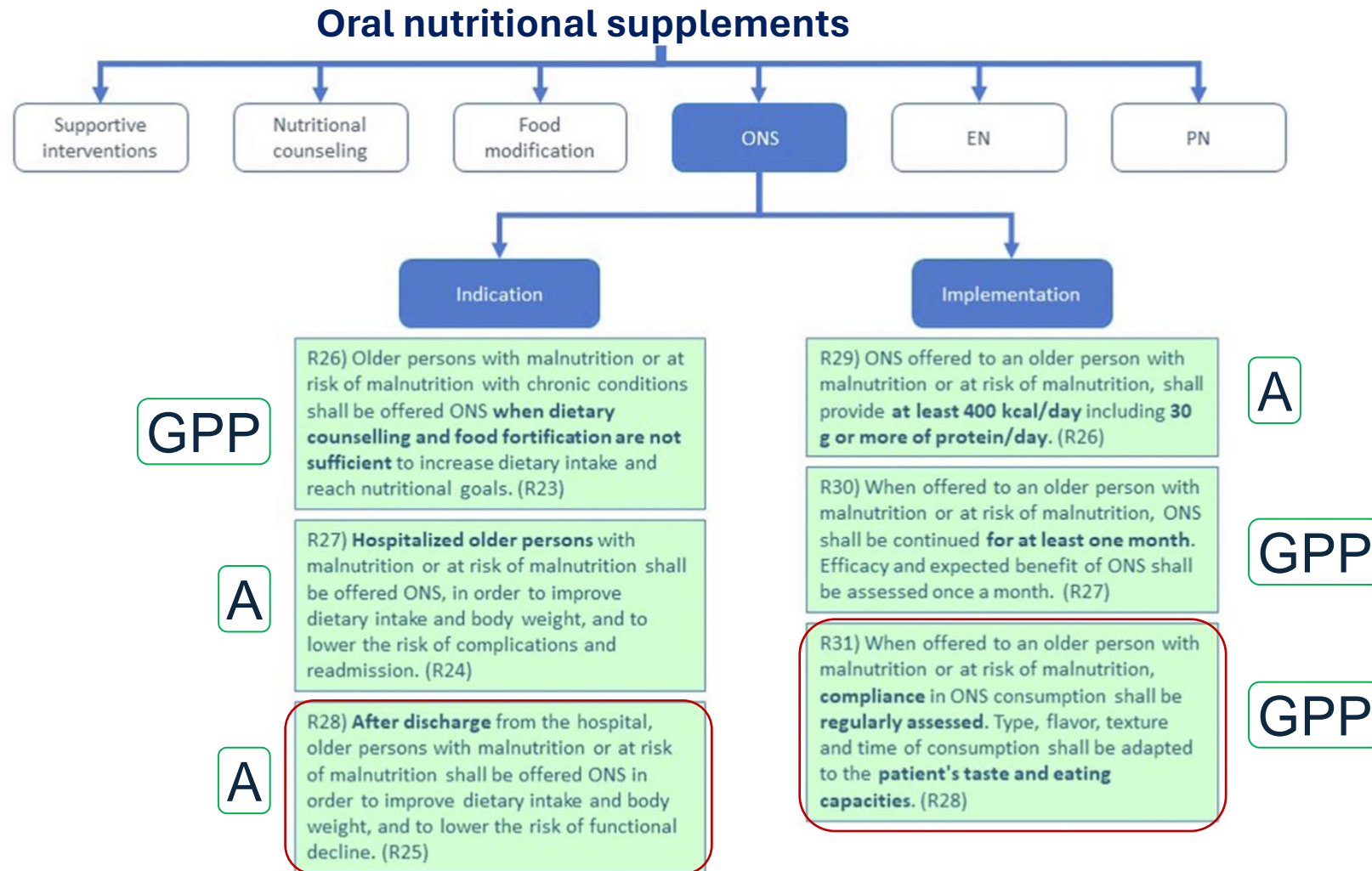
A

A

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# Prevention and treatment of malnutrition



# Prevention and treatment of malnutrition

## Enteral Nutrition

- If oral intake not possible for more than 3 days or if < 50% oral intake for more than 7 days
- Assessment of the benefit-risk ratio on an individual basis, depending on the clinical situation
- Never in end-of-life care
- If < 4 weeks, nasogastric tube
- If > 4 weeks or if NGTS not tolerated: gastrostomy

10  
0  
%

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GPP

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# Prevention and treatment of malnutrition

## Enteral and parenteral nutrition

Medical treatment

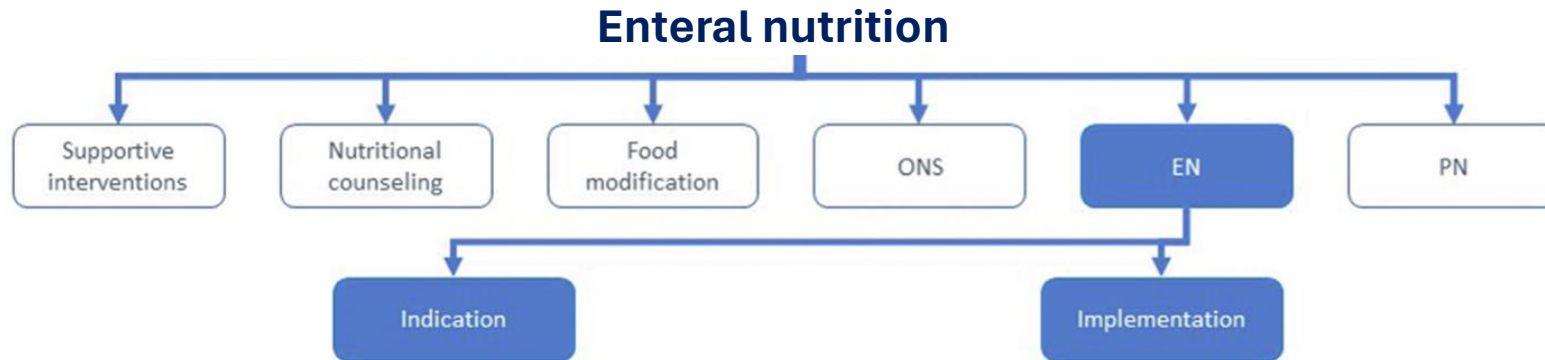
No medication or restraint to feed a patient

Should be started early, and increased gradually to avoid inappropriate renutrition syndrome

Inadequate renutrition syndrome: monitor P, Mg, K, B1



# Prevention and treatment of malnutrition



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R32) Older persons with reasonable prognosis shall be offered EN if oral intake is expected to be impossible for more than three days or expected to be below half of energy requirements for more than one week, despite interventions to ensure adequate oral intake, in order to meet the nutritional requirements and maintain or improve nutritional status. (R29)

GPP

R33) The expected benefits and potential risks of EN shall be evaluated individually and reassessed regularly and when the clinical condition changes. (R30)

GPP

R34) Older persons with low nutritional intake in the terminal phase of illness shall be offered **comfort feeding** instead of EN. (R31)

R35) If EN is indicated, it shall be **started without delay**. (R32)

R36) Older patients who require EN presumably for less than four weeks should receive a **nasogastric tube**. (R33)

R37) Older patients expected to require EN for more than four weeks or who do not want or tolerate a nasogastric tube should receive a percutaneous gastrostomy / **PEG**. (R34)

R38) Tube fed older patients shall be encouraged to **maintain oral intake** as far as safely possible. (R35)

R39) EN and PN and hydration shall be considered as **medical treatments** rather than as basic care, and therefore should only be used if there is a realistic chance of improvement or maintenance of the patient's condition and quality of life. (R37)

R40) Older patients should **NOT** receive **pharmacological sedation** or **physical restraints** to make EN or PN or hydration possible. (R38)

R41) In older patients with malnutrition, EN and PN shall **start early**; it shall be **gradually increased** during the first three days in order to avoid the refeeding syndrome. (R39)

R42) During the first three days of EN and PN therapy in malnourished older persons, **special attention** shall be drawn to **blood levels of phosphate, magnesium, potassium and thiamine** which shall be supplemented even in case of mild deficiency. (R40)

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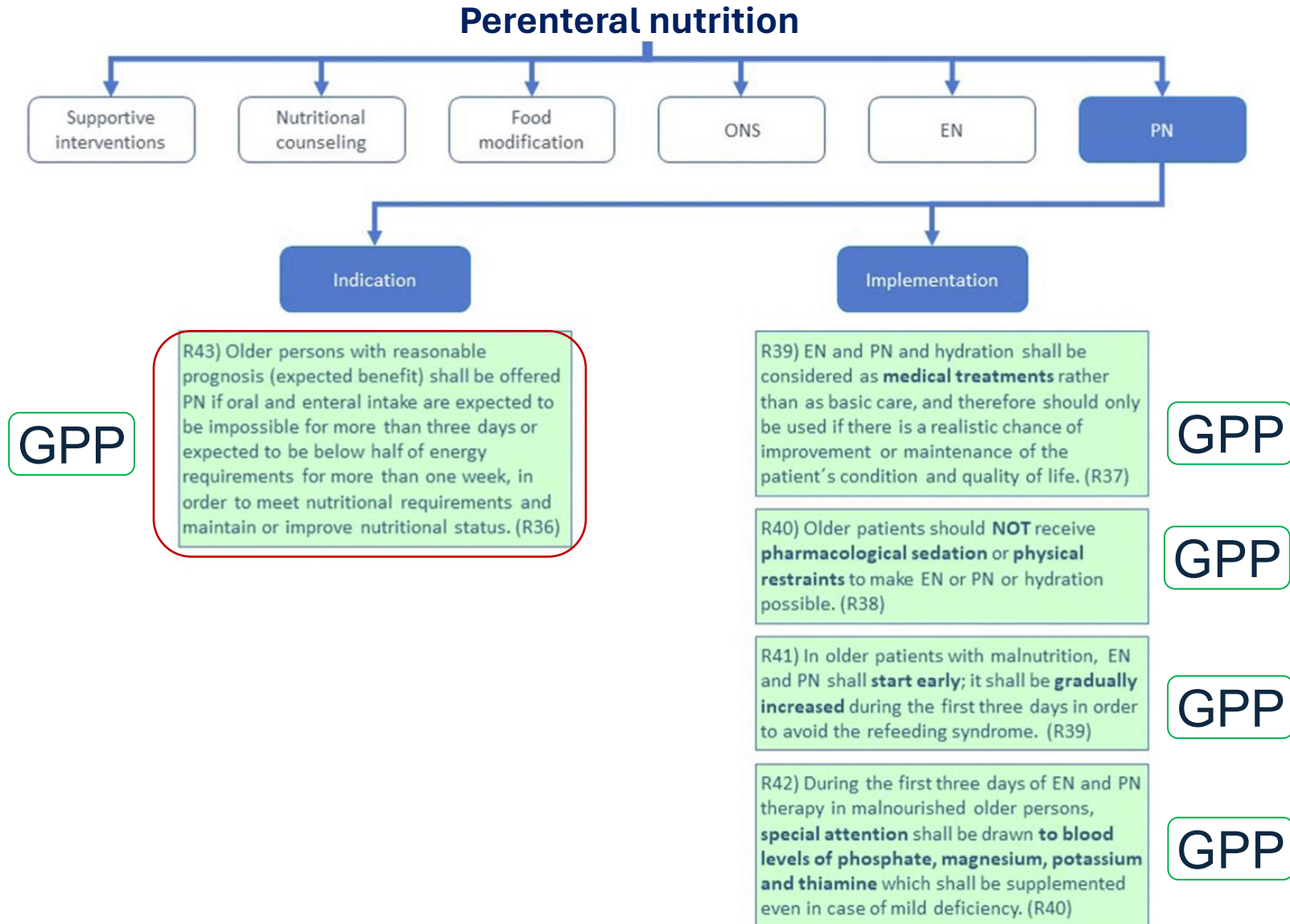
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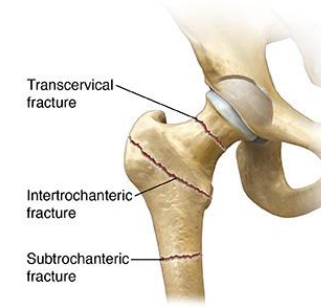
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# Prevention and treatment of malnutrition



# Reco for specific situations

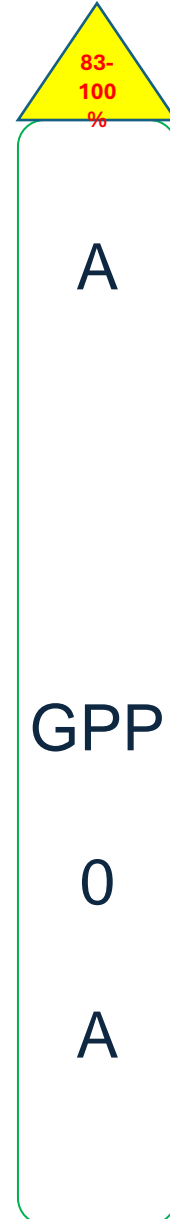


## Hip fracture:

- Providing a postoperative SNO, regardless of nutritional status, in association with a multidisciplinary approach

Cochrane (41 RCT - mean age 80 years old)

- No nocturnal enteral nutrition
- Possibly parenteral nutrition in association with SNO
- Nutritional intervention as an integral part of multidisciplinary geriatric management



# Reco for specific situations



95-  
100  
%

## Delirium:

- Une intervention non-pharmacologique multimodale incluant hydratation, nutrition dans les unités médicales et chirurgicales prévient le delirium.
- Dépister systématiquement la dénutrition et la déshydratation comme des facteurs précipitants potentiels du delirium en hospitalisation.

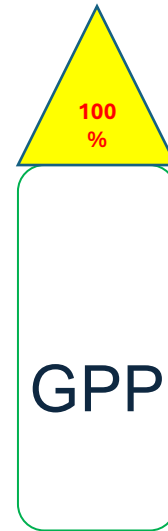
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# Reco for specific situations

## Depression:

Systematic screening for undernutrition in people with depression or at risk of depression



GERIATRIC DEPRESSION SCALE A 15 ITEMS

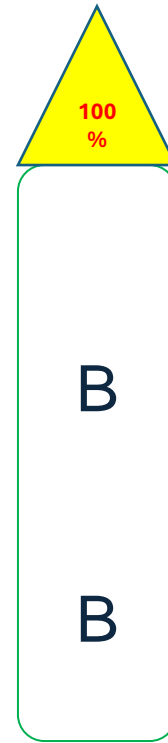
GDS - 15	Compter 1 point si :
Etes-vous satisfait de votre vie ?	Non
Avez-vous renoncé à un grand nombre de vos activités ?	Oui
Avez-vous le sentiment que votre vie est vide ?	Oui
Vous ennuyez-vous souvent ?	Oui
Etes-vous de bonne humeur la plupart du temps ?	Non
Avez-vous peur que quelque chose de mauvais vous arrive ?	Oui
Etes-vous heureux la plupart du temps	Non
Avez-vous le sentiment d'être désormais faible ?	Oui
Préférez-vous rester seul dans votre chambre / chez vous plutôt que de sortir ?	Oui
Pensez-vous que votre mémoire est plus mauvaise que celle de la plupart des gens ?	Oui
Pensez-vous qu'il est merveilleux de vivre à notre époque ?	Non
Vous sentez-vous une personne sans valeur actuellement ?	Oui
Avez-vous beaucoup d'énergie ?	Non
Pensez-vous que votre situation actuelle est désespérée ?	Oui
Pensez-vous que la situation des autres est meilleure que la vôtre ?	Oui
Score	/15



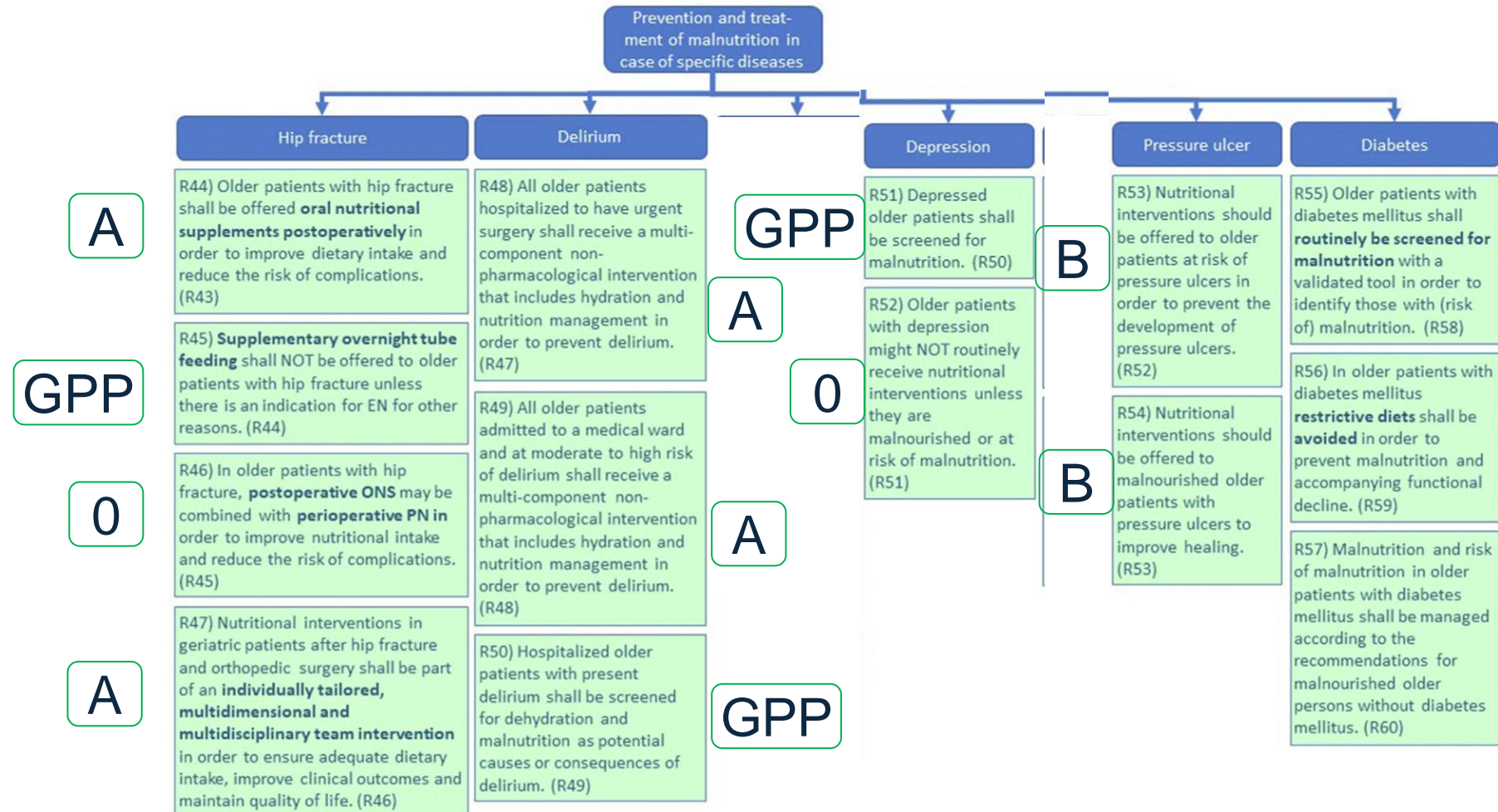
# Reco for specific situations

## (Risk of) pressure ulcers:

- Preventive nutritional intervention in patients at risk of undernutrition to prevent decubitus ulcers
- Therapeutic nutritional intervention in patients with pressure sores.



# Reco for specific situations



# Reco for specific situations

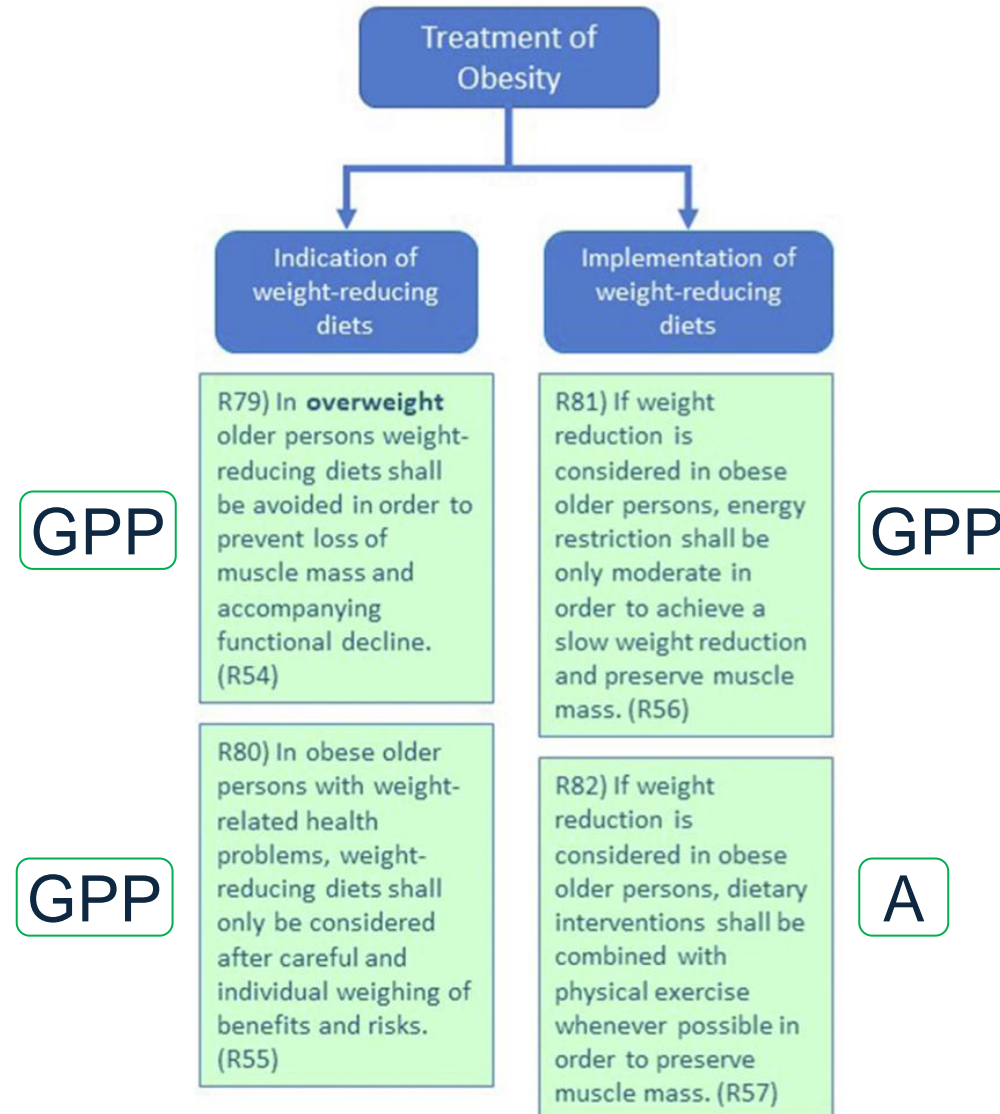
## Obesity:

- Obese with health problems: diet to be considered on an individual basis (risk-benefit ratio)
- If dieting, moderate calorie restriction, slow weight loss recommended
- -500 kcal/day less than estimated needs
- Minimum intake of 1000-1200 kcal/d
- Protein intake of 1g/kg/day
- Weight loss of 0.25-1kg per week
- Diet combined with physical activity



# Reco for specific situations

## Obesity:

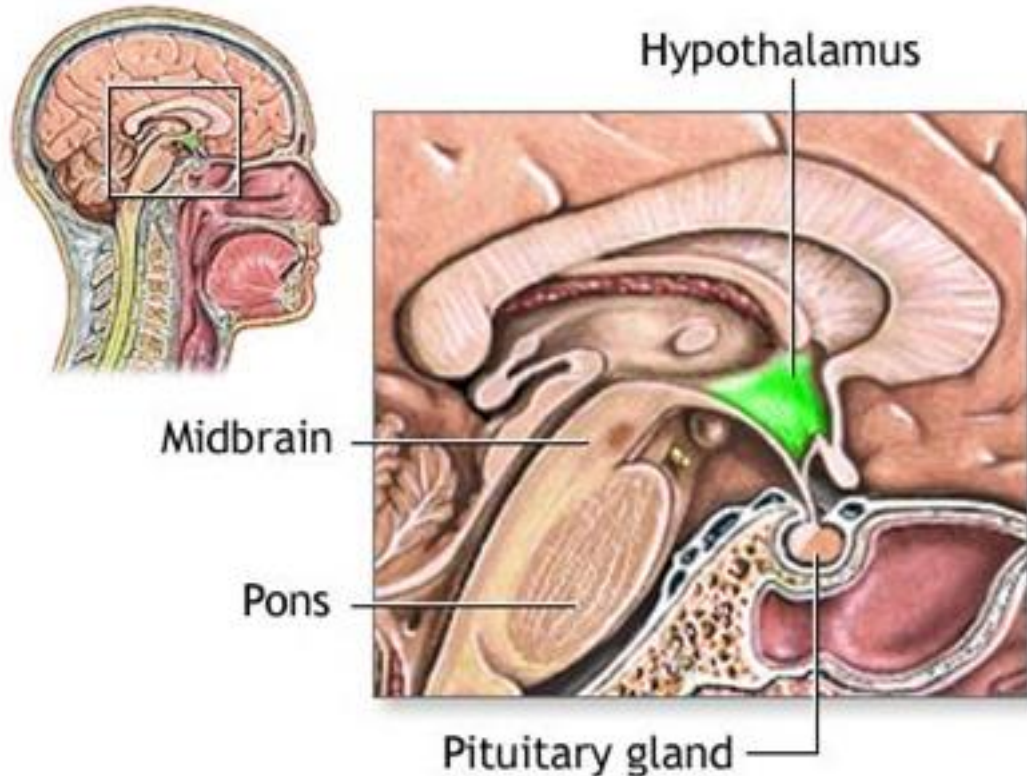




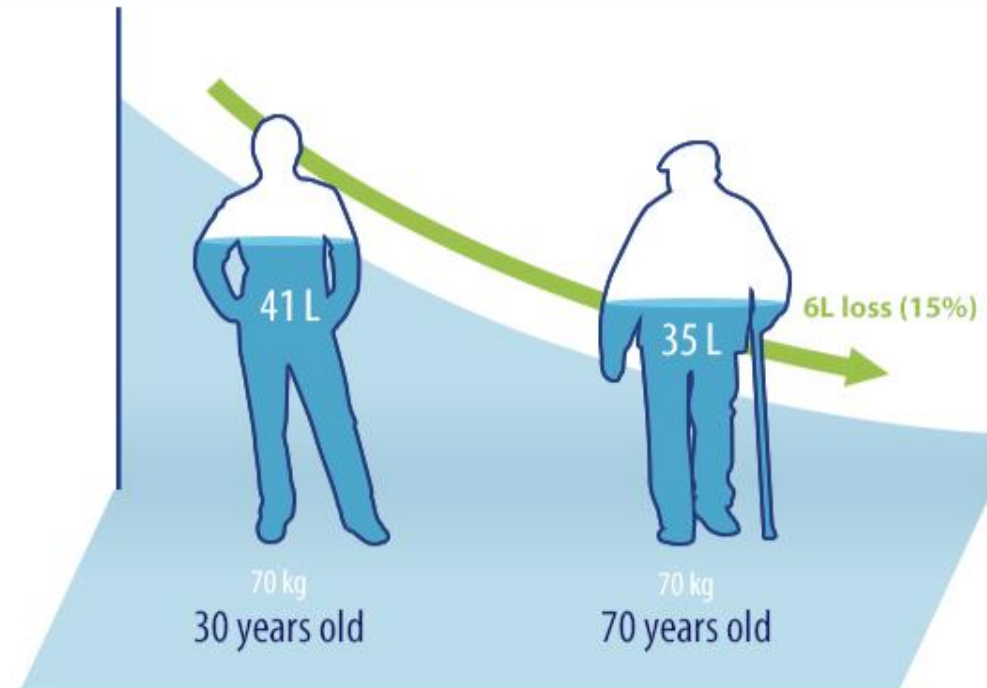
# Nutrition and hydration in Geriatrics

The principles of a good hydration in geriatric clinical practice  
Updated ESPEN guidelines for hydration

Thirst is mediated by osmoreceptors (hypothalamus) and ADH (posterior hypophysis)

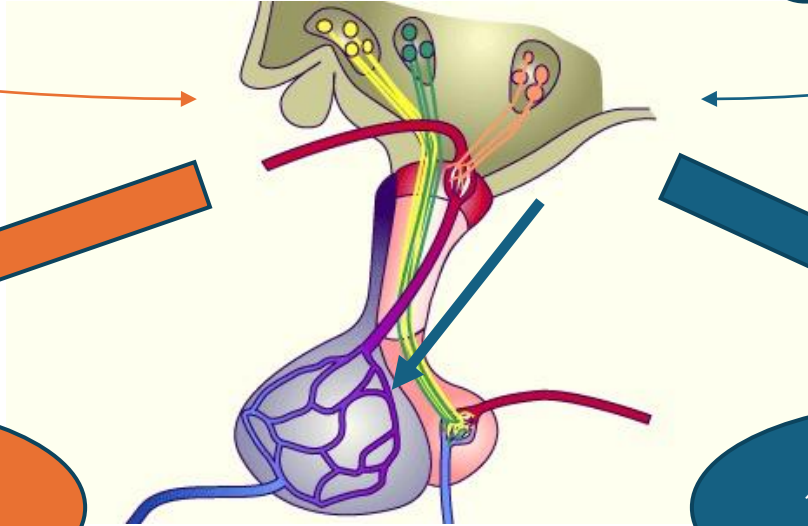


Total body water content declines with age



Dehydration  
 $\uparrow$  *osmolarity*

Hyperhydration  
 $\downarrow$  *osmolarity*



Thirst

Disgust of water

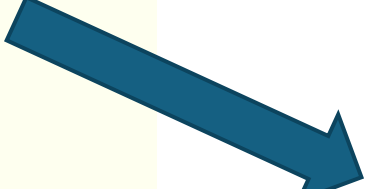
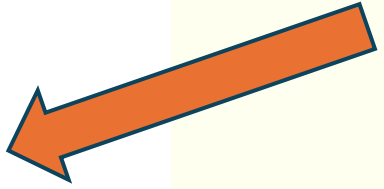


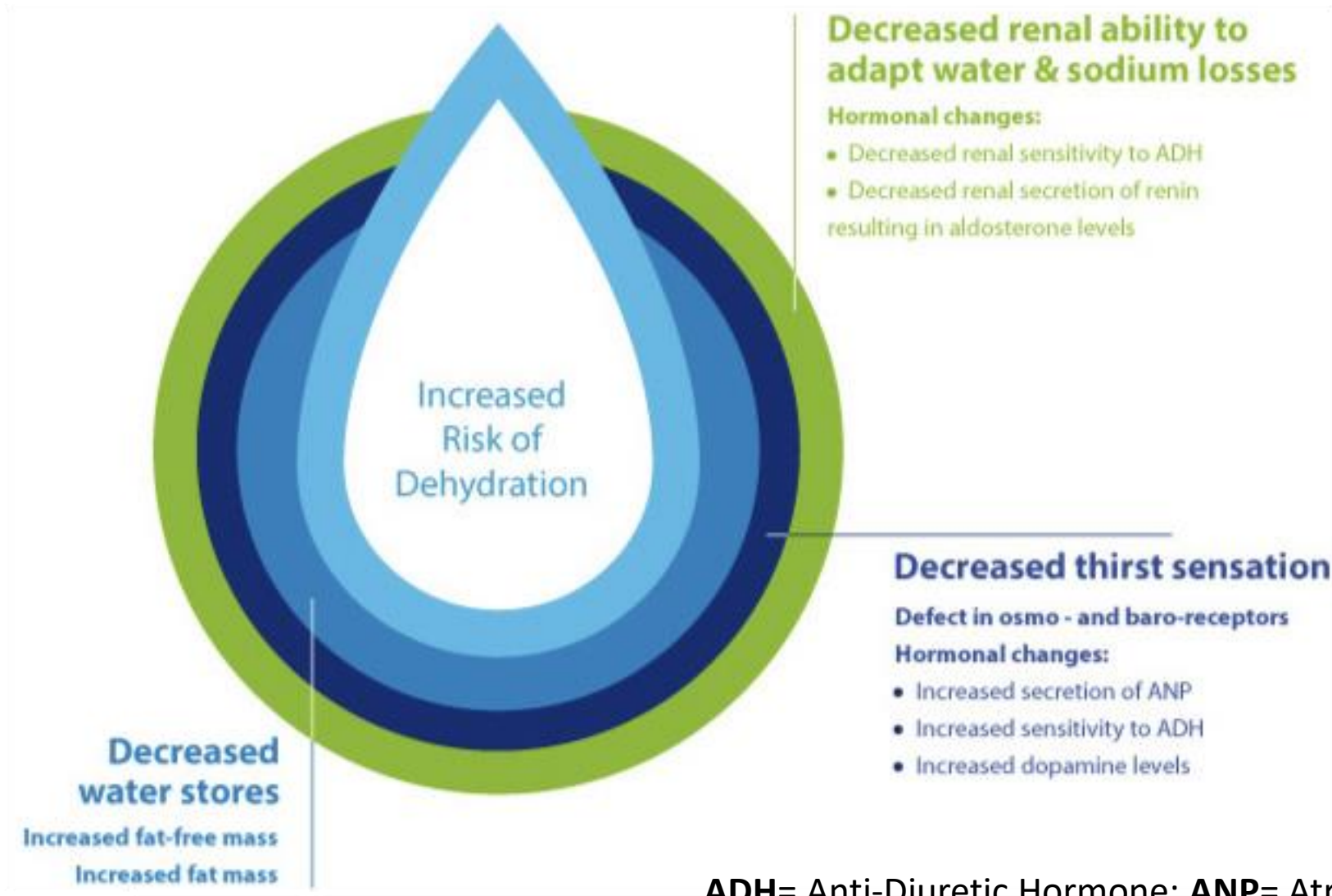
$\uparrow$  water absorption

$\uparrow$  water loss

$\downarrow$  diuresis

$\uparrow$  diuresis







### Body water stores

**Physiology:** lean masse, fat masse



### Water intake

**Physiology:** Decrease in thirst sensation

**Diseases:** Mental disorders

Fear of incontinence

Malnutrition

**Functional:** Decreased mobility

Reduced swallowing efficiency

**Environment:** Inadequate medical assistance



### Water losses

**Physiology:** Decline in renal function

**Diseases:** Diarrhoe, fever, vomiting, diabetes

**Environment:** Warm temperatures

**Drugs:** Laxatives, diuretics ...



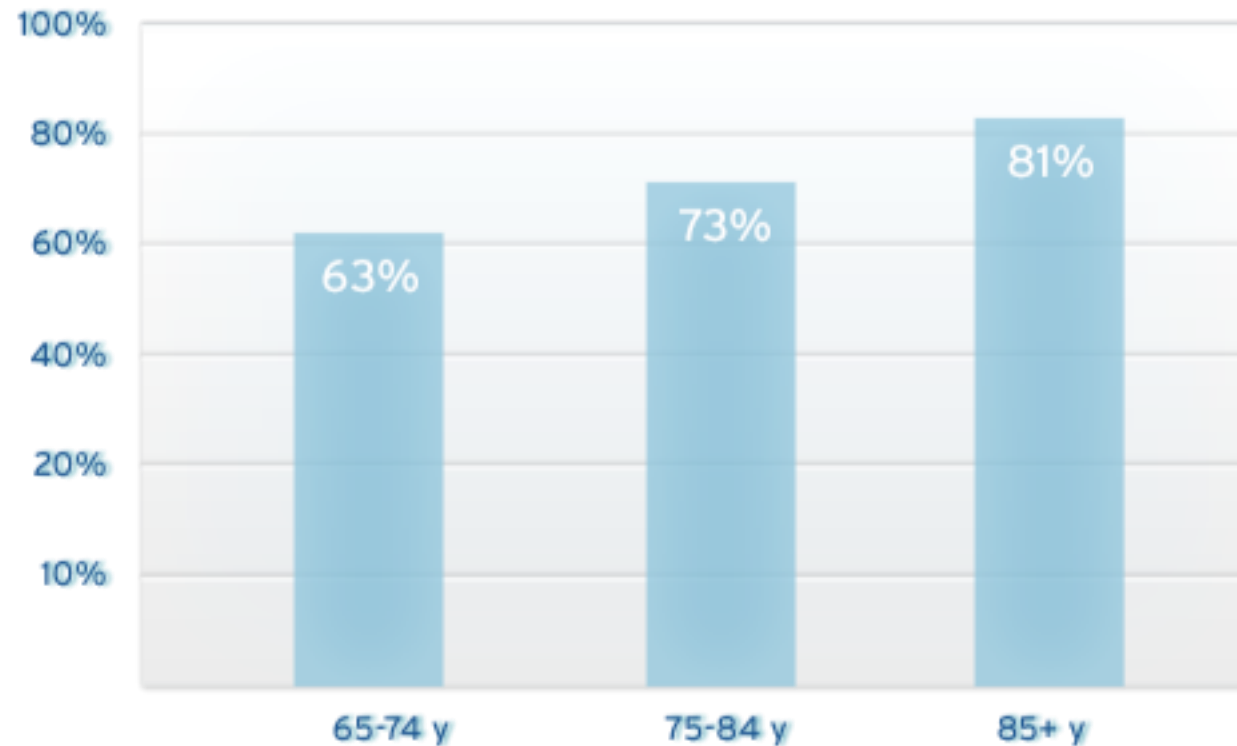
### Other

Ethnicity, gender

# Proportion of the US elderly not meeting recommendations for fluid intake from beverages and food\*.

\*Basing on IOM recommendations

% of US elderly not meeting recommendations



# Consequences of dehydration on the development of associated morbidities

Disease / health conditions	Level of evidence in the elderly population	Type of evidence in the elderly population	References
Constipation	Strong	Evidence from observational and one interventional studies Homogeneity in results	Anti, 1998 Manz, 2007 Robinson, 2002
Impaired cognition/ Acute confusion	Medium	Evidence from observational studies Heterogeneity in results from intervention studies	Kleiner, 1999 Suhr, 2004 Suhr, 2010 Popkin, 2010
Falling	Medium	Evidence from observational and one interventional studies Some heterogeneity in results	Costello, 2008 Water UK, 2005 Robinson, 2002
Hyperthermia	Medium	Limited evidence from interventional studies Plausible underlying mechanisms and evidence on population other than elderly	Begum, 2010
Glycaemic control (for diabetes or hyperglycaemia)	Medium	Limited evidence from interventional studies	Burge, 2001

Disease / health conditions	Level of evidence in the elderly population	Type of evidence in the elderly population	References
Orthostatic hypotension	Medium	Limited evidence from interventional studies Plausible underlying mechanisms and evidence on population other than elderly	Lu, 2003 Shannon, 2002
Salivary dysfunction (xerostomia)	Medium	Limited evidence from interventional studies Plausible underlying mechanisms and evidence on population other than elderly	Ship, 1997
Urinary tract infection	Weak	Limited observational data based essentially on extrapolation from mechanisms and on evidence on population other than elderly	Manz, 2007 Beetz, 2003
kidney stones	Weak	Based essentially on extrapolation from evidence on population other than elderly	Zanni 2009 Water UK, 2005
Coronary heart disease	Weak	Limited evidence from observational studies Some heterogeneity in results	Chan, 2002 Rodriguez, 2009 Leurs, 2010
Pressure ulcers	Weak	Limited evidence from observational and interventional studies Some heterogeneity in results	Casimiro, 2002 Stotts, 2003 Stotts, 2009
Medication toxicity	Weak	Based essentially on extrapolation from mechanisms	Begum, 2010

# How to assess the level of hydration?

- Trophicity of the skin and mouth, tongue
- Color of the urine
- Constipation
- Delirium (apathy)
- Fatigue, weakness, lethargy
- Thirst
  
- Tachycardia, low BP, vasoconstriction
- IR (urea  $>$  60xcreat), hyperNa+.

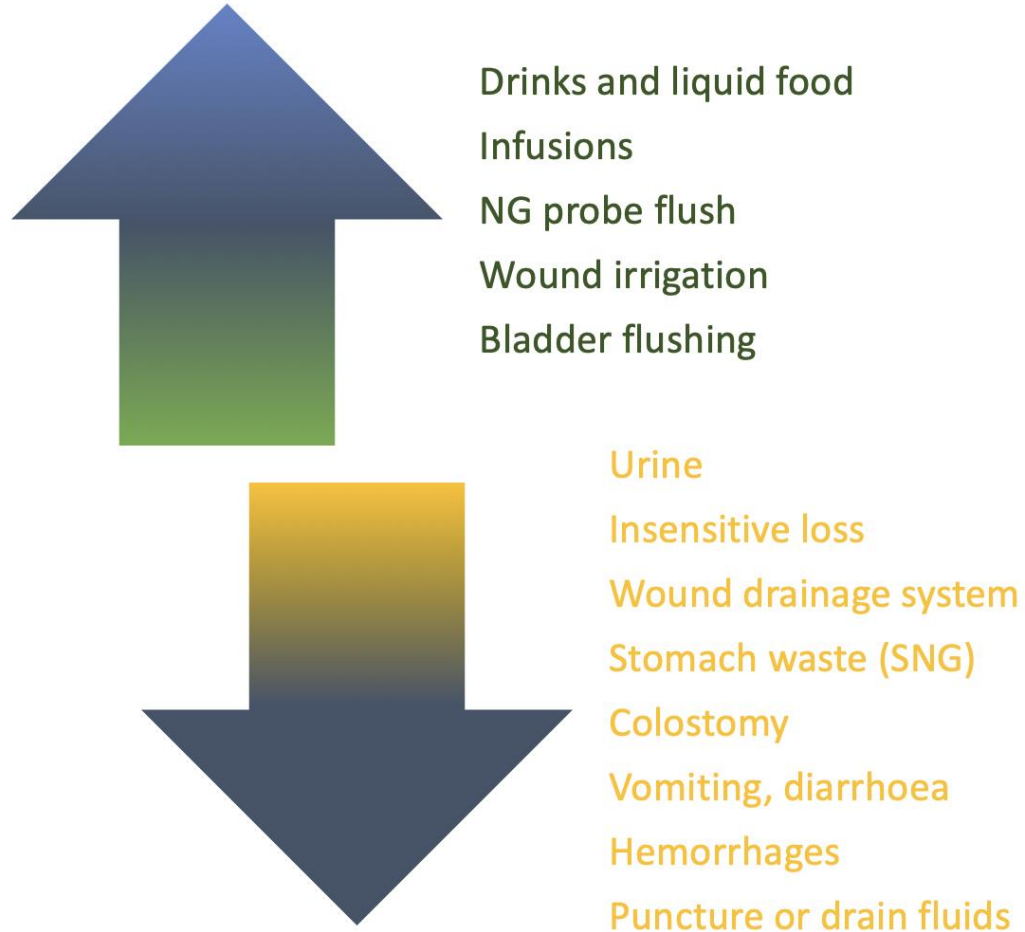




# How to assess the level of hydration?

SIGNS and SYMPTOMS	Loss of water	Loss of water and ions
<b>History :</b>		
	Recent weight loss > 3%	Recent weight loss > 3%
	Decreased water intake	
	Increased water loss (fever, tachypnea, heat)	Vomiting, diarrhoea, use of diuretics, bleeding
<b>Physical examination :</b>		
Dry tongue	+	+
Lengthwise groove in tongue	+	+
Decreased muscle strength in upper body	+	+
Confusion	+	+
Speaking difficulties, dysarthria	+	+
Sunken eyes	+	+
Blood pressure	Normal or decreased	Significantly decreased
<b>Biological features :</b>		
Serum creatinine	↑	↑
Serum urea	↑	↑↑
Serum sodium	↑	N ou ↓
Urine output	↓	↑, N ou ↓

# Daily water balance



IN - OUT =

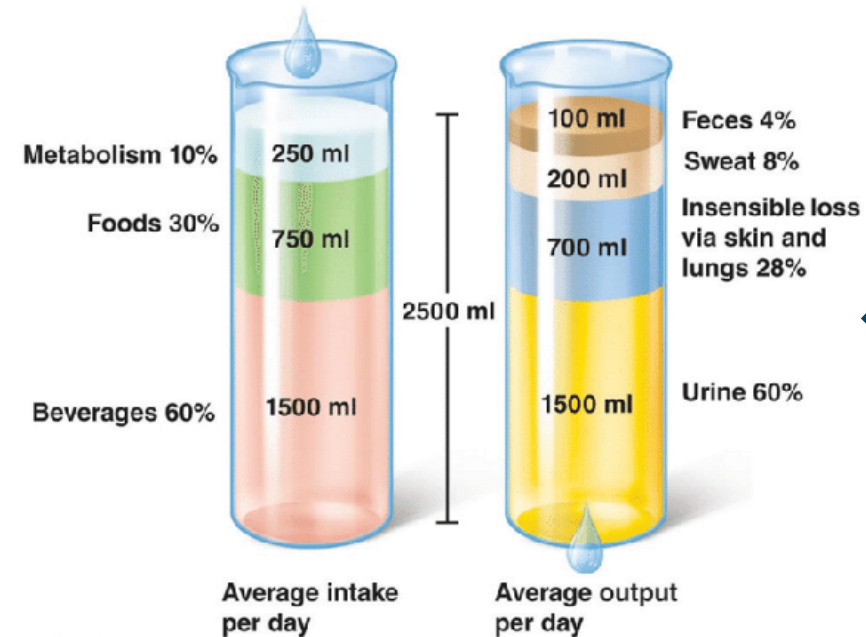
# Daily water balance

**Insensible loss:** perspiration (skin) + respiration (lungs) :  
measuring the patient's temperature

37°C : 700 ml

+1°C : +50 ml

-1°C : -50 ml



# Water requirements in older people

**Water requirements:  
30 ml/kg**

**Min 1,5L which  
700 ml of  
beverages**

**1 ml/ kcal**

**If fever, add  
500 ml (>38°C)**



# Prevention and treatment of dehydration

## Screening and assessment

- Every senior should be screened for the risk of dehydration.
- In all situations where there is a sudden change in clinical condition and periodically where there is a risk of undernutrition
- Assessment: do not rely on clinical signs (dry mouth, fold sign, dark urine)
- Assessment: do not use BIA (bioimpedancemetry)
- Assessment: the primary indicator is plasma osmolality
- Do not rely on renal function
- If osmolality cannot be measured, use the formula:  **$1.86 (Na^+ + K^+) + 1.15 \text{ glucose} + \text{urea} + 14$**
- If osmolality > 300 mOsm/kg, intervention
- Encourage patients and their families to monitor fluid intake



GPP

GPP

A

A

B

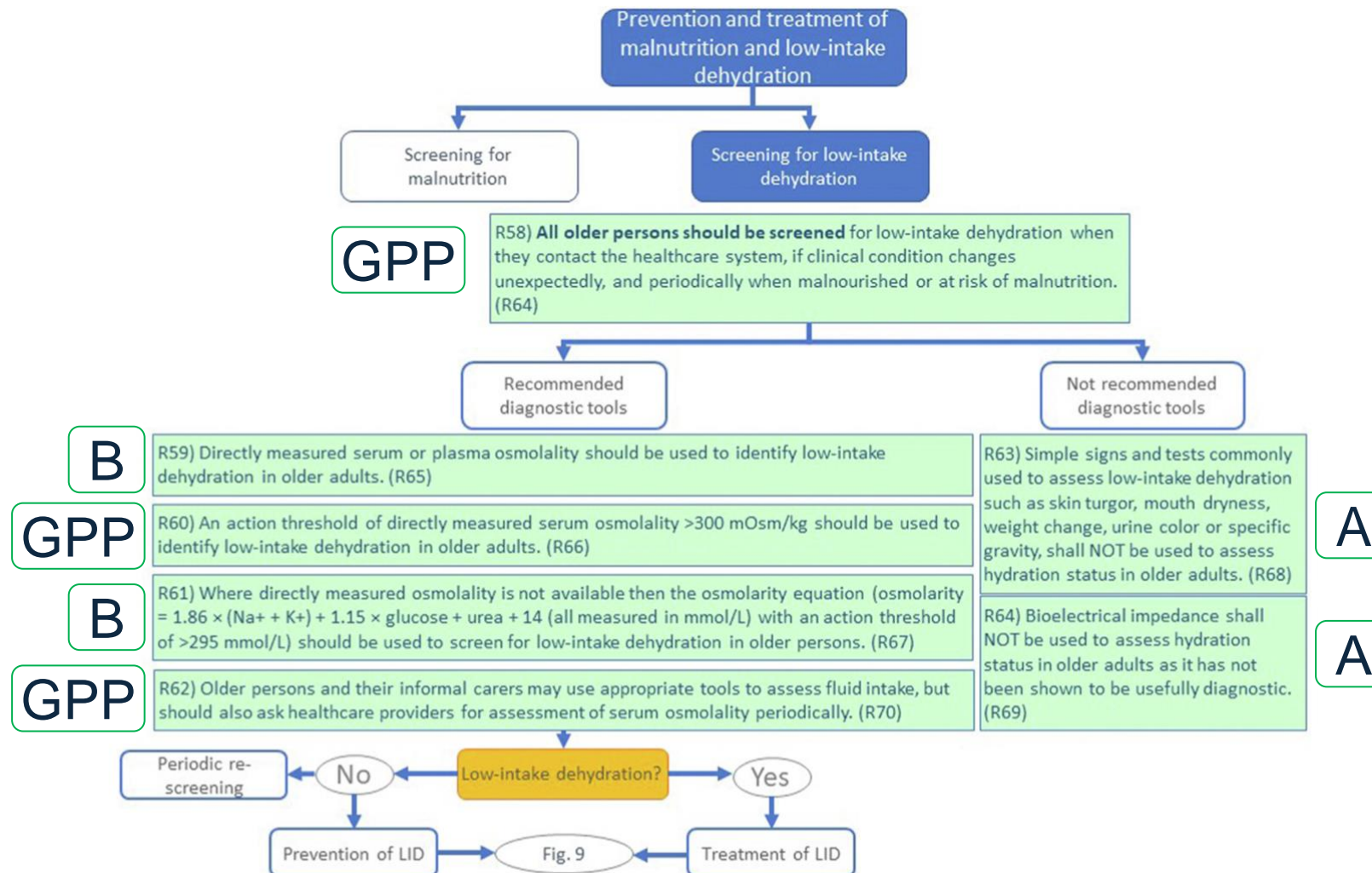
B

GPP

GPP

# Prevention and treatment of dehydration

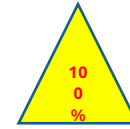
## Screening and assessment



# Prevention and treatment of dehydration

## Prevention

- All elderly people should be considered to be at risk of dehydration and should be encouraged to drink sufficient fluids.
- Drinking preferences should be taken into account.
- Prevent dehydration in MRS by means of a multi-component strategy that includes identifying the people most at risk, providing them with a variety of drinks that are within easy reach and offered regularly by trained staff. Also offer to accompany them to the toilet on a regular basis.
- A comprehensive hydration policy for the general population, including the elderly, carers and decision-making bodies.
- In the event of dysphagia, offer speech therapy.



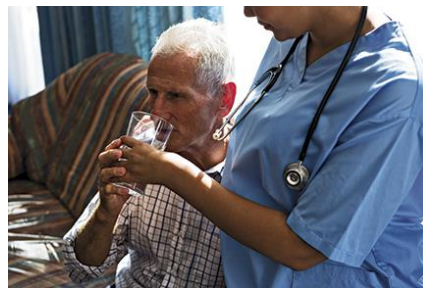
GPP

B

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B

GPP

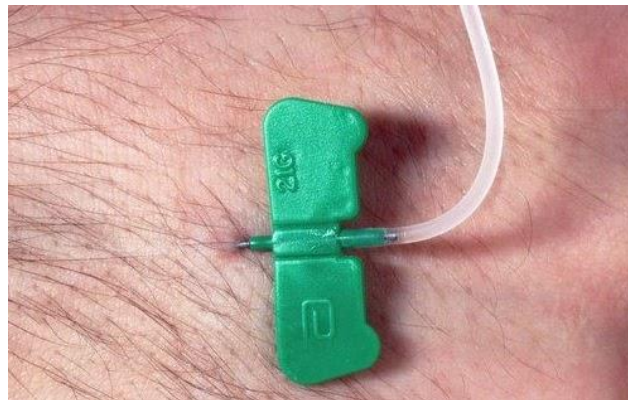


# Prevention and treatment of dehydration

## Treatment

When Posm > 300 mOsm/kg:

- If the patient is able to drink, encourage to drink the beverages of its choice.
- If the patient is clinically unwell or unable to hydrate orally, encourage them to drink and provide a subcutaneous or intravenous infusion.



GPP

A



# Prevention and treatment of dehydration

## Prevention and treatment

	Prevention of LID	Treatment of LID	
GPP	R65) All older persons should be considered to be <b>at risk</b> of low-intake dehydration and encouraged to consume adequate amounts of drinks. (R63)	R73) Older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolality >295 mmol/L) who appear well should be encouraged to increase their fluid intake in the form of drinks preferred by the older adult. (R71)	GPP
B	R66) A <b>range of appropriate</b> (i.e. hydrating) <b>drinks</b> should be offered to older people according to their preferences. (R62)		
B	R67) To prevent dehydration in older persons living in residential care, institutions should implement multicomponent strategies across their institutions for all residents. (R74)	R74) For older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolality >295 mmol/L) who appear unwell, subcutaneous or intravenous fluids shall be offered in parallel with encouraging oral fluid intake. (R72)	A
B	R68) Multi-component strategies to prevent dehydration in older persons living in residential care should include high availability of drinks, varied choice of drinks, frequent offering of drinks, staff awareness of the need for adequate fluid intake, staff support for drinking and staff support in taking older adults to the toilet quickly and when they need it. (R75)	R75) For older adults with measured serum or plasma osmolality >300 mOsm/kg (or calculated osmolality >295 mmol/L) and unable to drink, intravenous fluids shall be considered. (R73)	A
B	R69) Strategies to support adequate fluid intake should be developed including older persons themselves, staff, management and policymakers. (R76)		
B	R70) Care plans for older adults in institutions should record individual preferences for drinks, how and when they are served, as well as continence support, to promote drinking. Assessment of individual barriers and promoters of drinking should lead to plans for supporting drinking specific to each older person. (R77)		
B	R71) At a regulatory level, the strategy of mandatory monitoring and reporting by institutions of hydration risks in individual residents and patients should be considered. (R78)		
GPP	R72) Older adults who show signs of dysphagia should be assessed, treated and followed up by an experienced speech and language therapist. Their nutrition and hydration status should be carefully monitored in consultation with the speech and language therapist and a dietician. (R79)		

# Prevention and treatment of dehydration

## Treatment

Syn. : extracellular dehydration

In the event of hydro-electrolyte depletion :

Blood loss, vomiting, diarrhoea

Clinical signs :

- Orthostatic hypotension (blood loss: + 30 bpm)
- 4 of the following signs: confusion, slurred speech, weakness of the extremities, dry mucous membranes, dry tongue, "roasted" tongue, sunken eyes.

Hydration by mouth, SC, IV or SNG



B

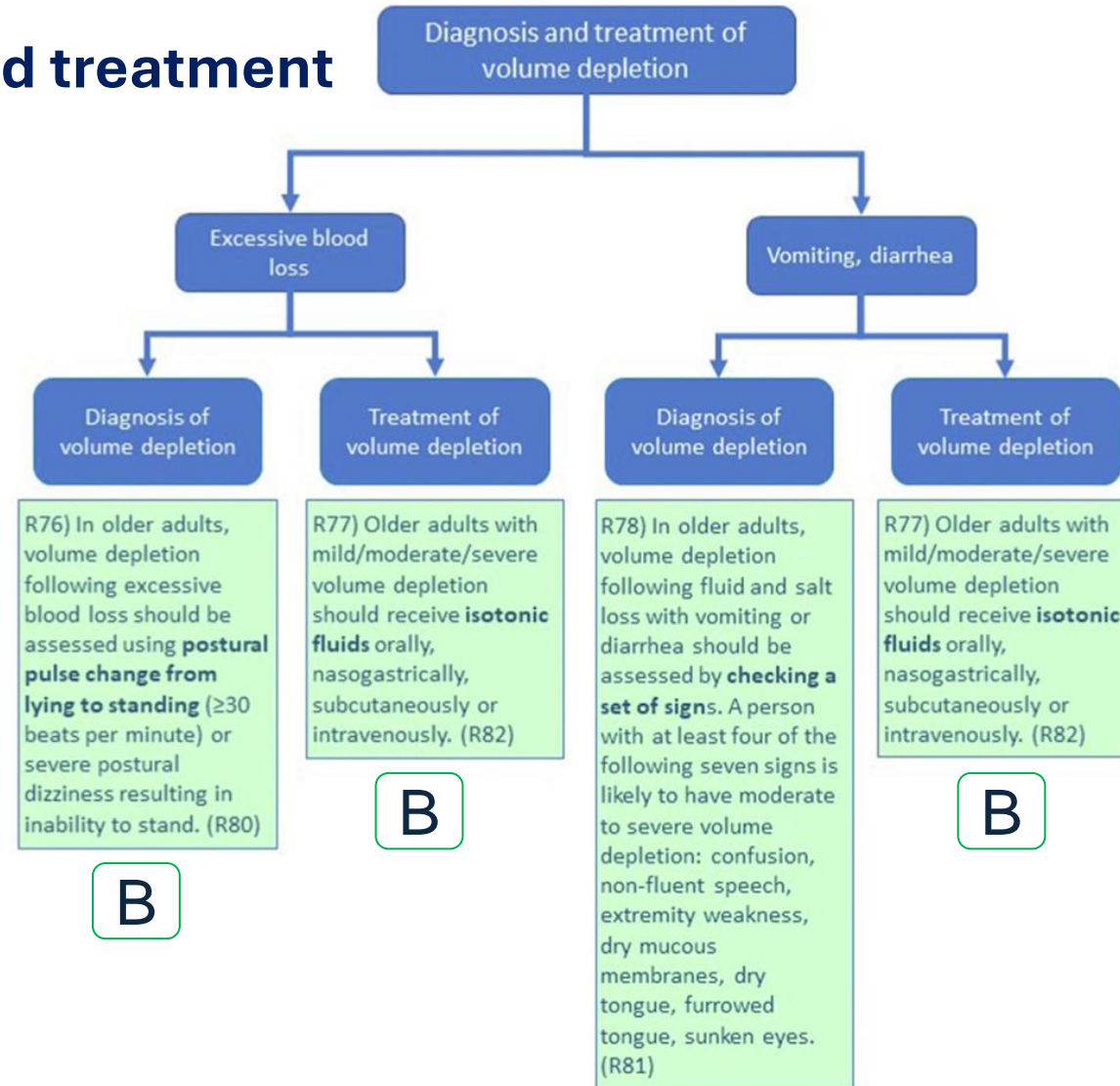
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# Prevention and treatment of dehydration

## Prevention and treatment

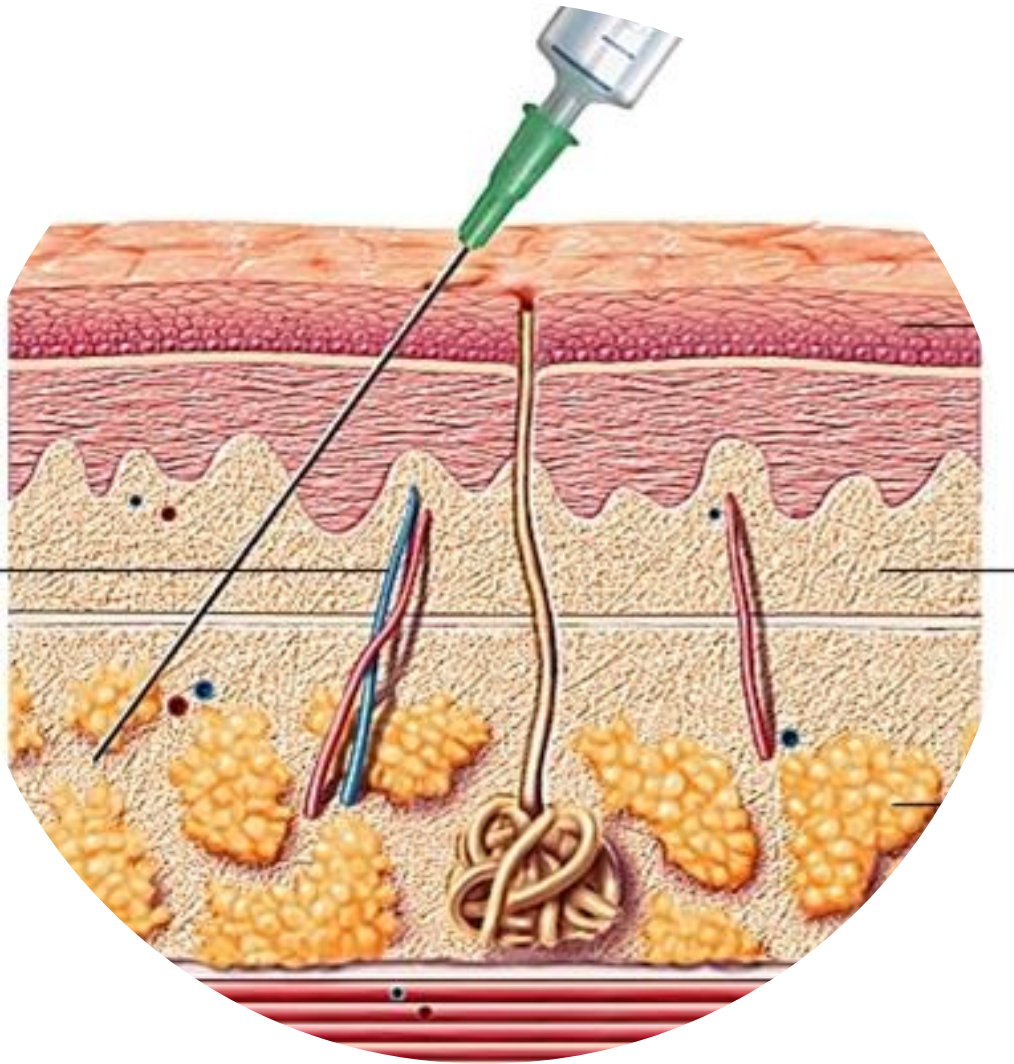




22-24-gauge  
needle inserted  
at 45° angle into  
the sc space

# Subcutaneous infusion

- Common sites : abdomen, thigh, pectoral, outer arm, interscapular space
- Transparent semi-permeable cover
- Rate of infusion : 62 mL/hour/24h or 1500 cc/24h or 1000 mL/8h at night or 500 mL/2h
- Multiple sites are allowed
- ≤10 days
- Best supported osmolarity range : 280-300 mOsm/L
- Less effective but safer than IV route is moderately dehydrated patients

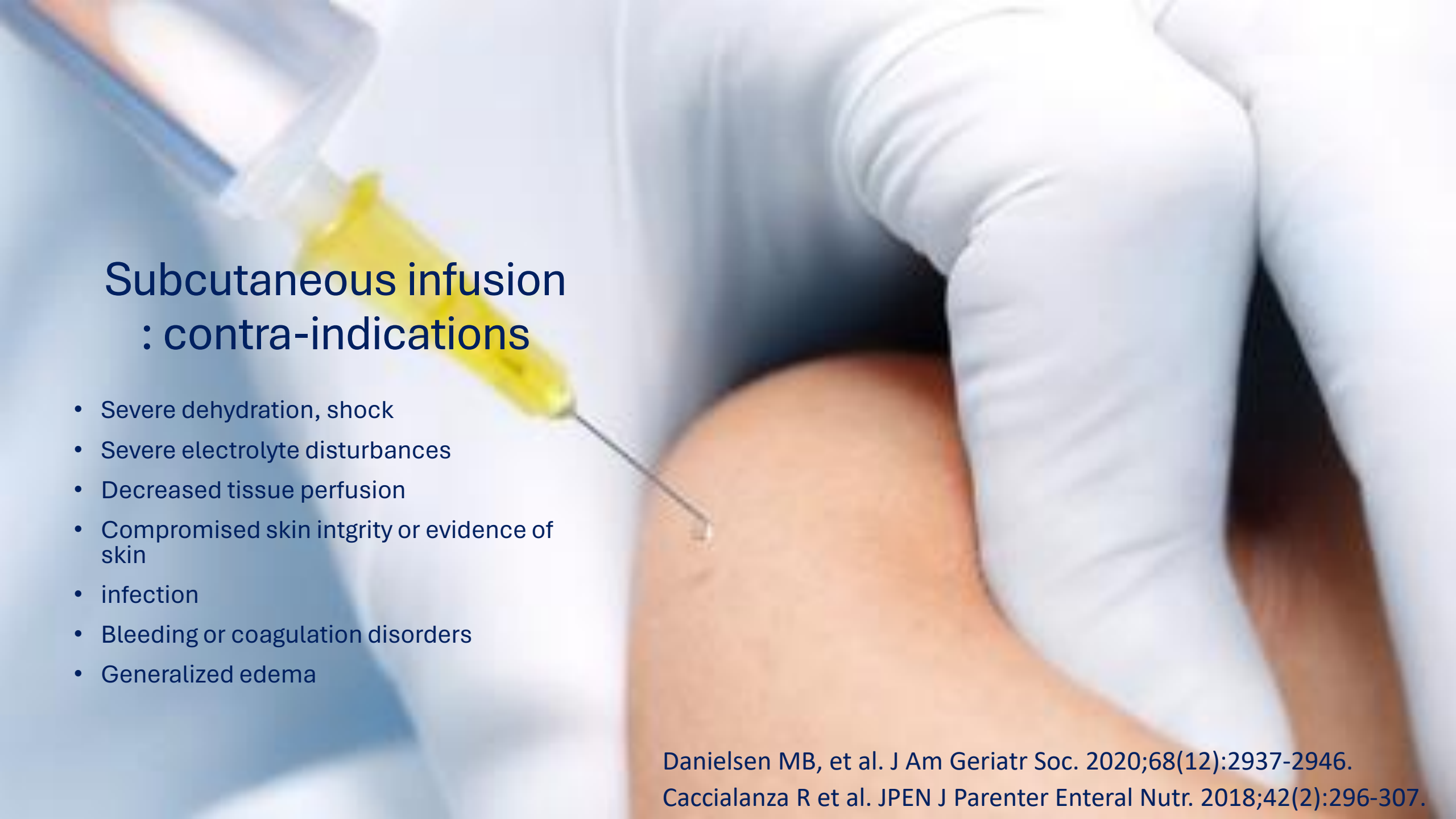


# Subcutaneous infusion : indications

- P with mild to moderate dehydration or mild to moderate malnutrition when oral intake is insufficient; in case of dysphagia
- When placement of an IV catheter is not possible, tolerated, or desirable
- In multiple settings, including emergency department, hospital, outpatient clinic, nursing home, and home.
- Always discuss the care planning in case of late-stage dementia

Danielsen MB, et al. J Am Geriatr Soc. 2020;68(12):2937-2946.

Caccialanza R et al. JPEN J Parenter Enteral Nutr. 2018;42(2):296-307.



## Subcutaneous infusion : contra-indications

- Severe dehydration, shock
- Severe electrolyte disturbances
- Decreased tissue perfusion
- Compromised skin integrity or evidence of skin infection
- Bleeding or coagulation disorders
- Generalized edema

Danielsen MB, et al. J Am Geriatr Soc. 2020;68(12):2937-2946.

Caccialanza R et al. JPEN J Parenter Enteral Nutr. 2018;42(2):296-307.

# Nutrition and Hydration in Geriatrics

The refeeding syndrome : think about it!



## What is the refeeding syndrome (RS)?

RS is historically described as a range of metabolic and electrolyte alterations occurring as a result of the reintroduction of calories after a period of decreased or absent caloric intake.

Hallmarks : electrolyte shifts (hypophosphatemia, hypokalemia and hypomagnesemia) and vitamin deficiency (thiamine), with or without clinical symptoms (peripheral edema, tachycardia and tachypnea).

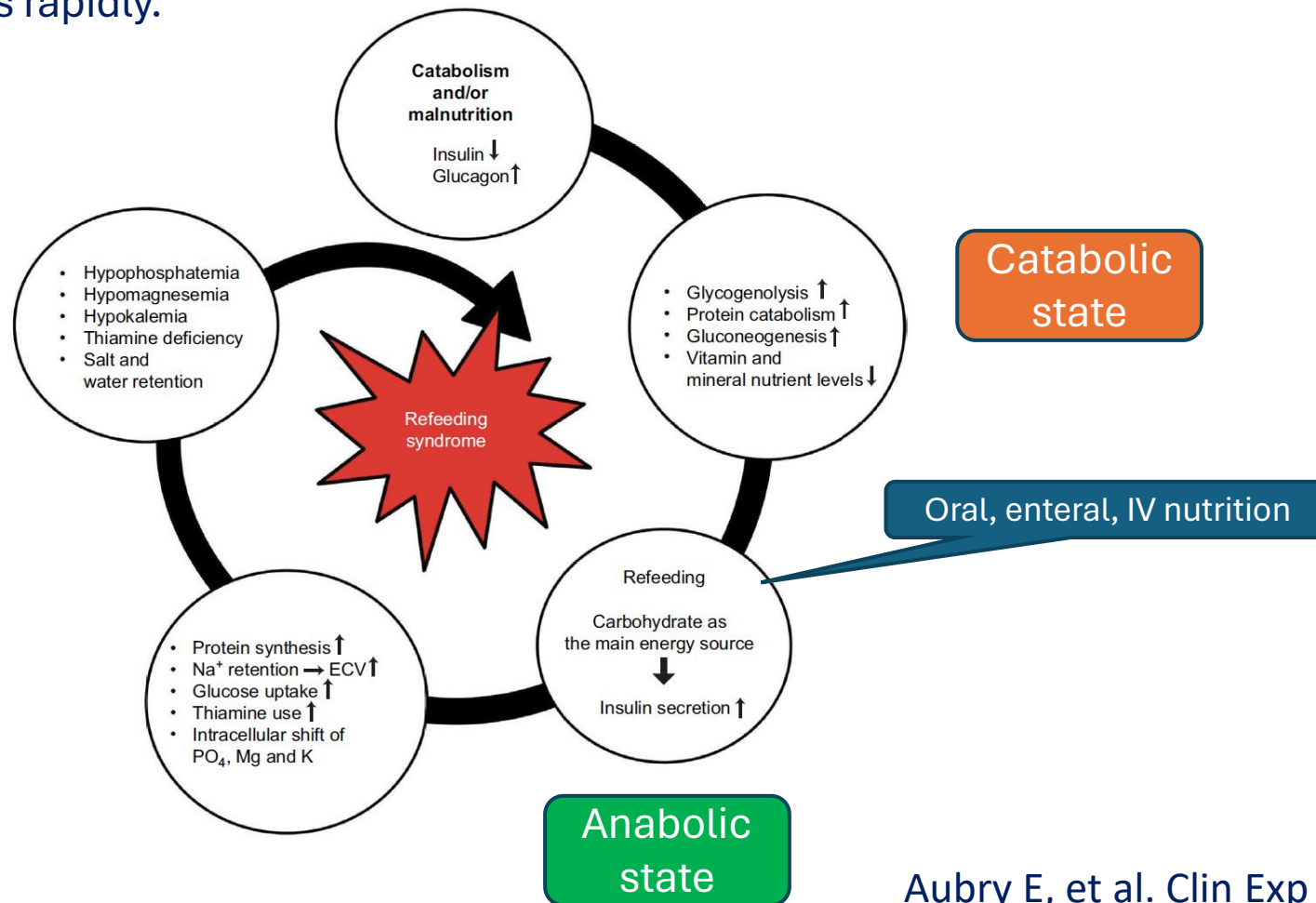
da Silva JSV, et al. Consensus Recommendations for Refeeding Syndrome. *Nutr Clin Pract.* 2020;35(2):178-195.

Friedli N, et al. Refeeding syndrome: update and clinical advice for prevention, diagnosis and treatment. *Curr Opin Gastroenterol.* 2020;36(2):136-140.



# Pathophysiology

Switch from a catabolic to an anabolic state after a prolonged starving period. Begins after **72 hours**, and progresses rapidly.



# ASPEN definition of the refeeding syndrome

- A decrease in any 1, 2, or 3 of serum phosphorus, potassium, and/or magnesium levels
  - by 10%–20% : mild RS
  - by 20%–30% : moderate RS
  - or by >30% and/or organ dysfunction resulting from a decrease in any of these and/or due to thiamin deficiency : severe RS.
- And occurring within 5 days of reinitiating or substantially increasing energy provision.

# Biological and clinical symptoms

- **Hypophosphatemia** → neuromuscular weakness, lethargy, **tachypnea**, hematological problems
- **Hypokaliemia, hypomagnesemia** → **arythmia**, rhabdomyolysis, confusion, respiratory insufficiency
- **Salt and water retention** → **edema**, heart failure
- **Lack of thiamine (B1)** → metabolic acidosis, Wernicke encephalopathy, wet beriberi, edema



# Biological and clinical symptoms

Hypophosphatemia	Hypokalemia	Hypomagnesemia	Thiamin Deficiency	Sodium Retention
Neurological	Neurological	Neurological	Encephalopathy	Fluid overload
Paresthesias	Paralysis	Weakness	Lactic acidosis	Pulmonary edema
Weakness	Weakness	Tremor	Nystagmus	Cardiac
Delirium	Cardiac	Muscle twitching	Neuropathy	decompensation
Disorientation	Arrhythmias	Changed mental	Dementia	
Encephalopathy	Contraction changes	status	Wernicke's syndrome	
Areflexic paralysis	Respiratory failure	Tetany	Korsakoff psychosis	
Seizures	Gastrointestinal	Convulsions	Wet and dry beriberi	
Coma	Nausea	Seizures		
Tetany	Vomiting	Coma		
Cardiac	Constipation	Cardiac		
Hypotension	Other	Arrhythmias		
Shock	Rhabdomyolysis	Gastrointestinal		
Decreased stroke volume	Muscle necrosis	Anorexia		
Decreased mean arterial		Nausea		
Pressure		Vomiting		
Increased wedge pressure		Constipation		
Pulmonary				
Diaphragmatic weakness				
Respiratory failure				
Dyspnea				
Hematologic				
Hemolysis				
Thrombocytopenia				
Leukocyte dysfunction				

# Refeeding syndrome in frail geriatric patients

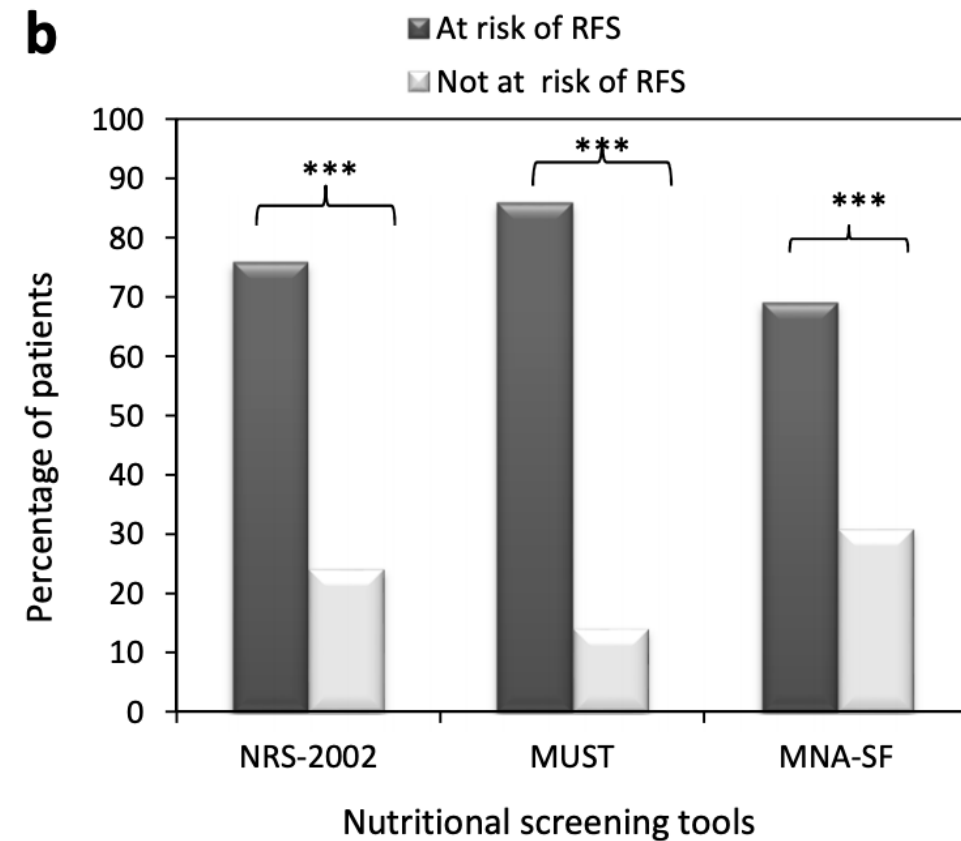
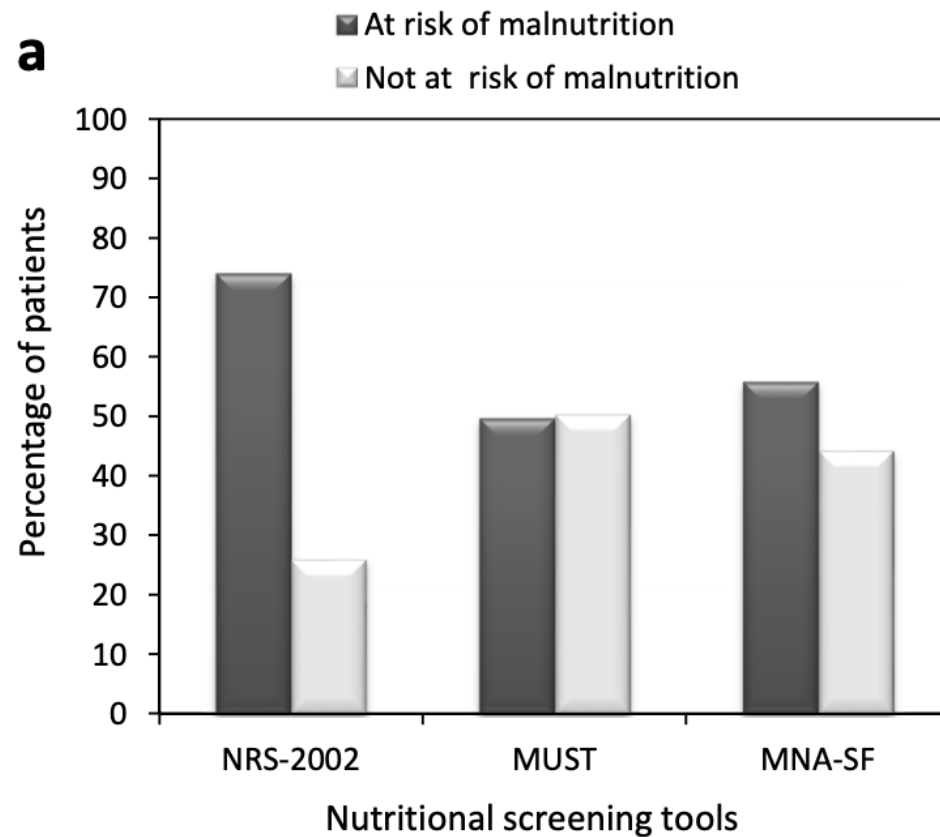
Probably unrecognized and undertreated in geriatric units.

Symptoms are aspecific (weakness, confusion, poor mobility).

Prevalence is estimated at **14%**, but is more frequent in geriatric patients at risk of malnutrition or malnourished : **75%**.

**Hypophosphatemia** is an independent predictor of mortality (HR x3.0).

# Prevalence of malnutrition and of refeeding syndrome in geriatric patients



# Prevention : identify early at-risk patients

## Risk factors according to NICE guidelines

Patient has one or more of the following:

- BMI less than 16 kg/m<sup>2</sup>
- unintentional weight loss greater than 15% within the last 3–6 months
- little or no nutritional intake for more than 10 days
- low levels of potassium, phosphate or magnesium prior to feeding.

Or patient has two or more of the following:

- BMI less than 18.5 kg/m<sup>2</sup>
- unintentional weight loss greater than 10% within the last 3–6 months
- little or no nutritional intake for more than 5 days
- a history of alcohol abuse or drugs including insulin, chemotherapy, antacids or diuretics.

Action	RFS		
	OR	95 % CI	P value
Phosphate	3.44	2.07 – 8.31	0.000
Magnesium	2.61	1.09 – 6.13	0.000
WL in 3 months	2.37	1.41 – 3.99	0.000
WL in 6 months	2.01	1.20 – 5.30	0.003
Potassium	1.50	0.25 – 2.73	0.002
Diuretics	1.06	0.12 – 1.28	0.026
No significant nutrition intake	1.01	0.09 – 1.24	0.032
Antiacids	1.00	0.60 – 2.3	0.671
Insulin therapy	0.86	0.52 – 1.44	0.703

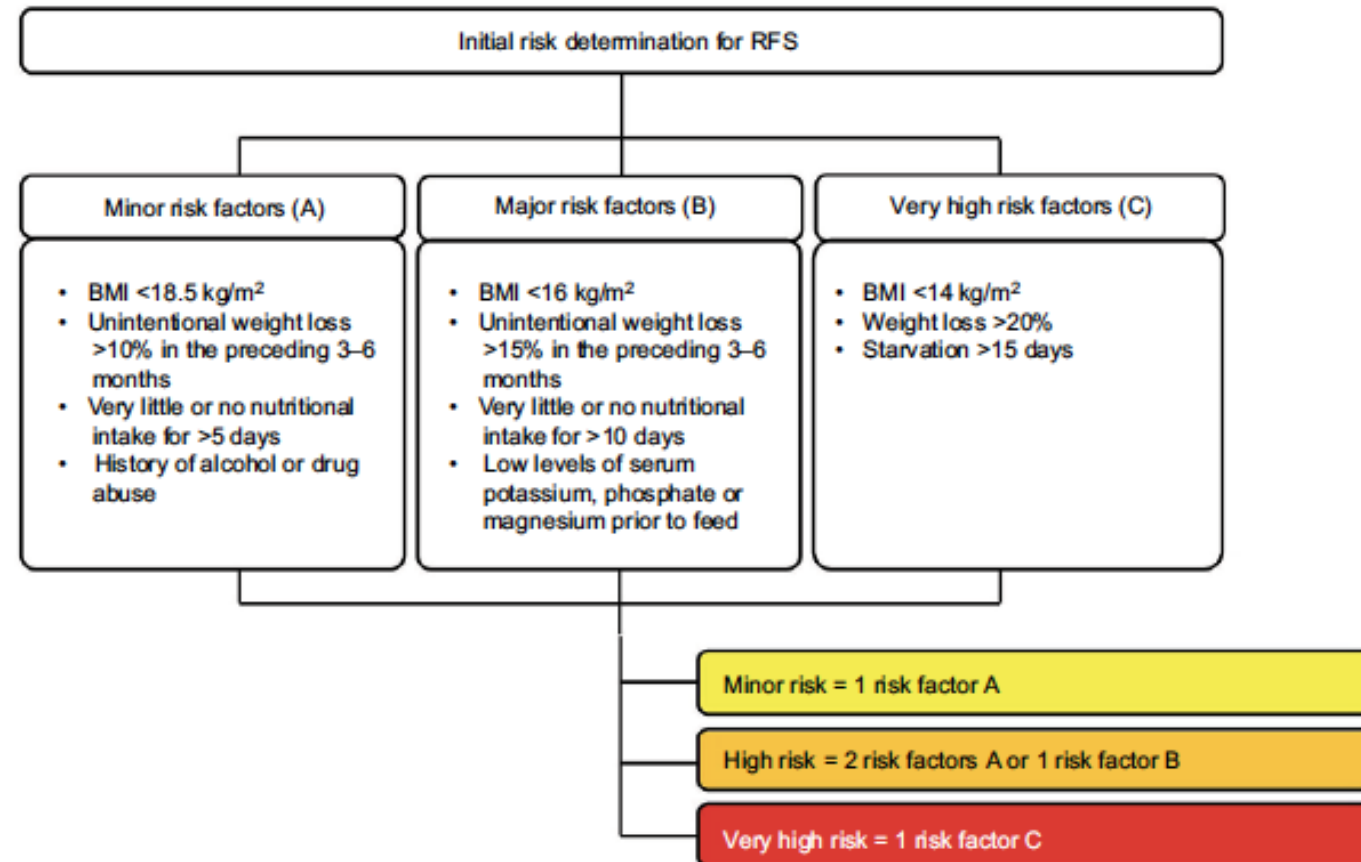
WL; weight loss, RFS; refeeding syndrome, OR; odds ratio, CI; confidence interval.

<https://www.nice.org.uk/guidance/cg32>

Pourhassan M, et al. J Nutr Health Aging. 2018;22(3):321-327.

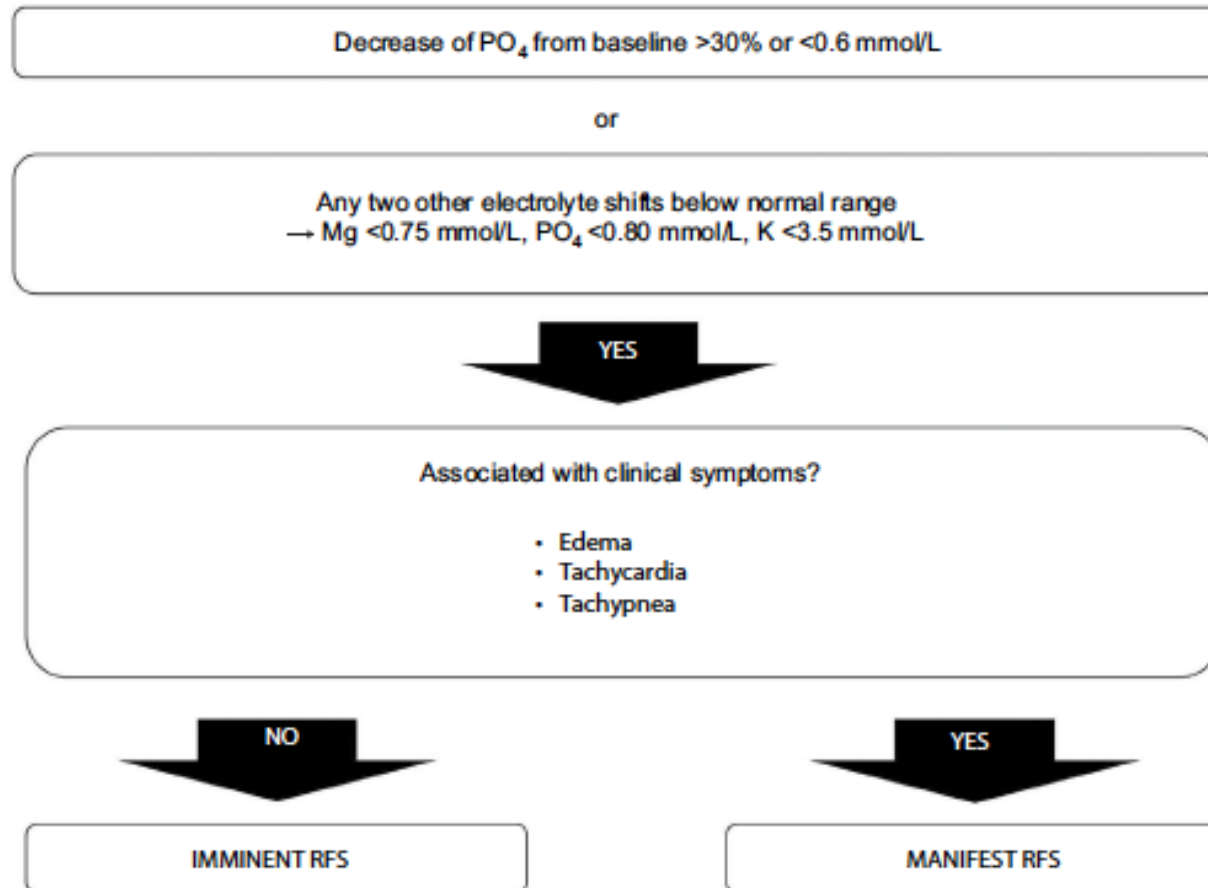
# Prevention : identify early at-risk patients

Level of risk stratification :





# Diagnosis



# Management

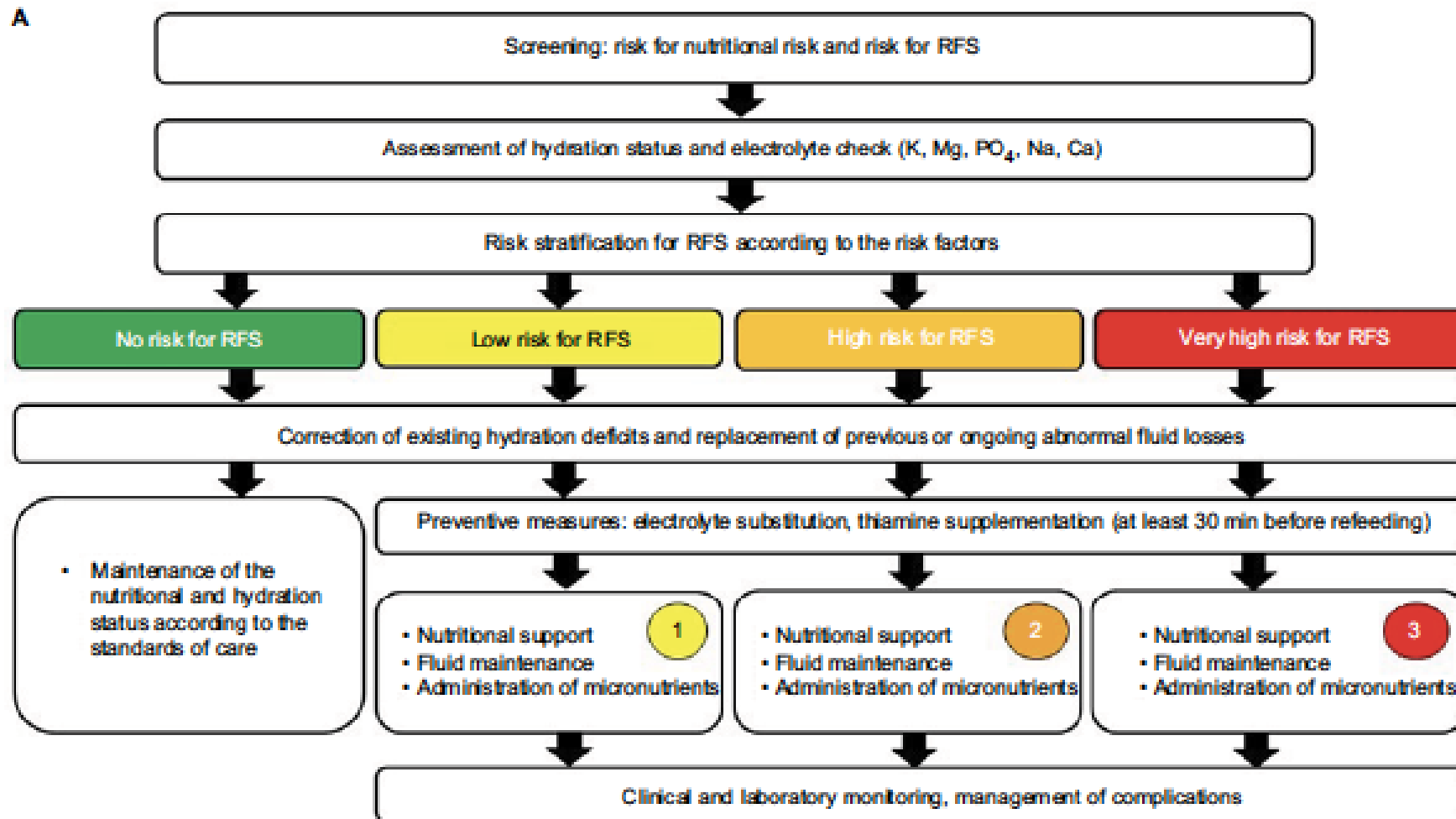
- **Fluids** : prefer balanced electrolyte solutions to 0.9% NaCl solutions
  - A fluid input of 20–25 mL/kg/d is needed to maintain the balance.
- **Salt restriction** (Na < 1 mmol/kg/d) in patients with (very) high risk for RFS
  - Check daily for water balance (in/out)
- **Electrolytes** : replete before the start of nutrition.
  - Add HPO<sub>4</sub> even if phosphorus is normal.
  - Add K<sup>+</sup>, Mg if low.
  - Assess electrolytes status frequently.
- **Vitamin B1** : 200-300mg (30 minutes before the start of nutrition)
- **Avoid iron supplements for the first 7 days : increases K<sup>+</sup> needs (RBC production)**
- **Nutrition** : begin with 5-15 kcal/kg/d ( 40–60% carbohydrate, 30–40% fat and 15–20% protein)

# Electrolytes repletion

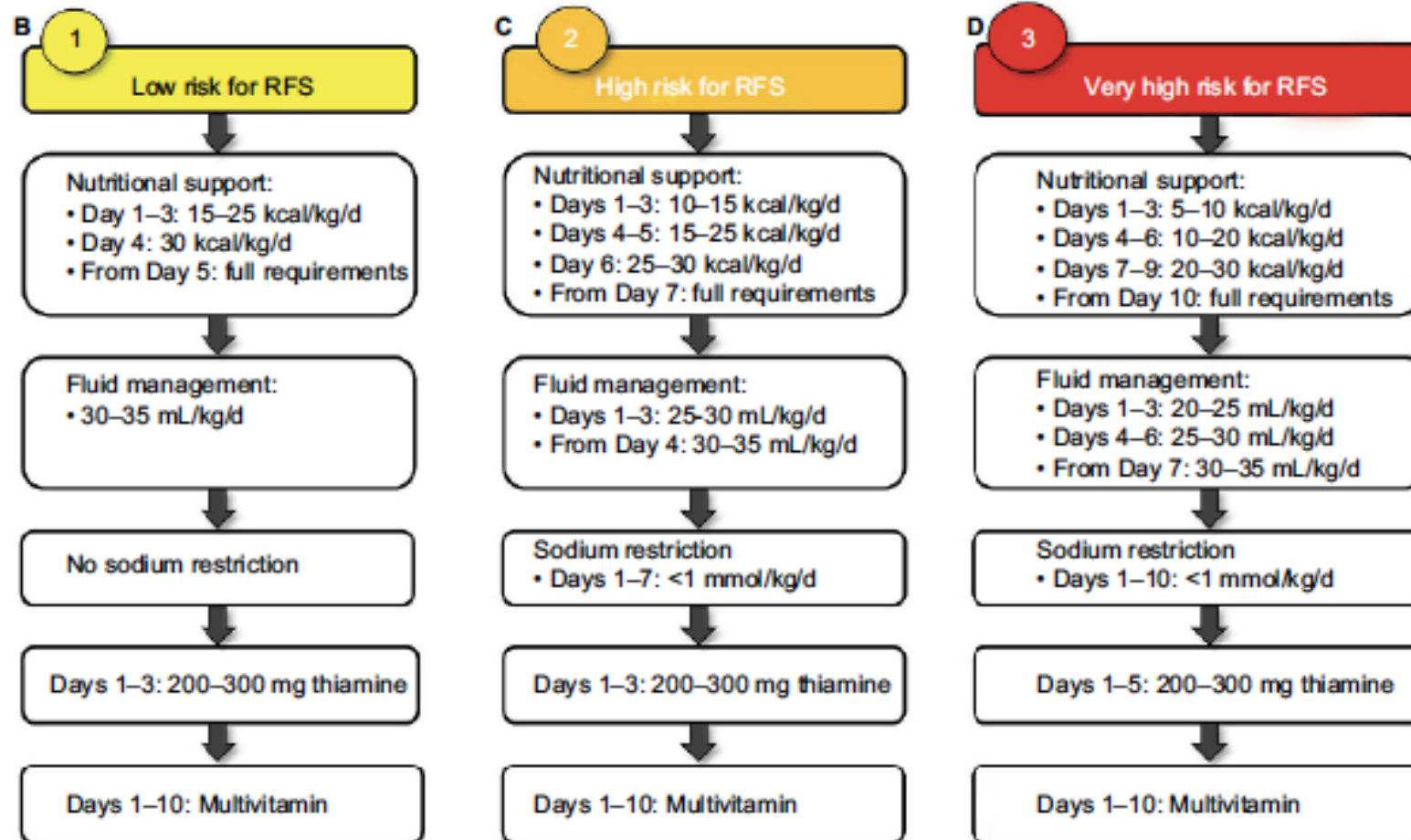
**Table 1** Suggested supplementation regimen<sup>28,29,74–78</sup>

	<b>Potassium</b>	<b>Magnesium</b>	<b>Phosphate</b>
Mild deficiency	3.1–3.5 mmol/L Oral replacement with 20 mmol (as KCl or other salts) or i.v. replacement with 20 mmol KCl over 4–8 hours. Check levels the next day	0.5–0.7 mmol/L Oral replacement with 10–15 mmol Mg-chloride or Mg-citrate or Mg-L-aspartate Oral Mg should be given in divided doses to minimize diarrhea (absorption process is saturated at about 5–10 mmol Mg)	0.61–0.8 mmol/L Oral replacement with 0.3 mmol/kg/d PO <sub>4</sub> (divided doses to minimize diarrhea) or i.v. replacement with 0.3 mmol/kg/d PO <sub>4</sub> (as K <sub>3</sub> PO <sub>4</sub> or Na <sub>3</sub> PO <sub>4</sub> ) over 8–12 hours. Check levels the next day
Moderate deficiency	2.5–3.0 mmol/L i.v. replacement with 20–40 mmol KCl over 4–8 hours. Check levels after 8 hours, if not normal levels, give further 20 mmol KCl		0.32–0.6 mmol/L i.v. replacement with 0.6 mmol/kg/d PO <sub>4</sub> (as K <sub>3</sub> PO <sub>4</sub> or Na <sub>3</sub> PO <sub>4</sub> ) over 8–12 hours. Check levels after 8–12 hours and repeat infusion if necessary (max. of 50 mmol PO <sub>4</sub> in 24 hours)
Severe deficiency	<2.5 mmol/L i.v. replacement with 40 mmol KCl over 4–8 hours. Check levels after 8 hours, if not normal levels, give further 40 mmol KCl	<0.5 mmol/L i.v. replacement with 20–24 mmol MgSO <sub>4</sub> (4–6 g) over 4–8 hours. Reassess every 8–12 hours	<0.32 mmol/L Same replacement therapy as for moderate deficiency

# Management



# Management



# The Refeeding Syndrome revisited: you can only diagnose what you know

A questionnaire with a case vignette about an older person who developed RFS after initiation of nutritional therapy was submitted to German physicians and fifth year medical students.

Of the 281 participants who answered, 40 participants (14%) correctly diagnosed the RFS...

Variables	Diagnosis of RFS			p Value	
	n (%)	Correct and nearly correct (n = 61, 22%)	Not correct (n = 220, 78%)		
Gender	Male	123 (41.0)	19 (17.0)	94 (83.0)	0.136
	Female	178 (59.0)	40 (25.0)	122 (75.0)	
Age	21-30	130 (43.0)	17 (15.0)	97 (85.0)	0.011
	31-40	62 (20.0)	11 (18.0)	49 (82.0)	
	41-50	50 (17.0)	14 (28.0)	36 (72.0)	
	51-60	53 (17.0)	18 (39.0)	28 (61.0)	
	61-70	7 (2.0)	1 (14.0)	6 (86.0)	
	71-80	1 (1.0)	-	-	
	>80	-	-	-	
Medical position	Assistant physician	91 (30.0)	24 (28.0)	62 (72.0)	<0.001
	Senior physician	44 (15.0)	14 (36.0)	25 (64.0)	
	Chief	17 (5.0)	4 (25.0)	12 (75.0)	
	Private office	25 (8.0)	4 (16.0)	21 (84.0)	
	Retirement	1 (1.0)	-	-	
	Others	15 (5.0)	8 (57.0)	6 (43.0)	
	Student	108 (36.0)	4 (4.0)	91 (96.0)	
Professional experience	<5	169 (55.0)	21 (14.0)	131 (86.0)	<0.001
	5-10	45 (15.0)	12 (28.0)	31 (72.0)	
	10-20	33 (11.0)	16 (50.0)	16 (50.0)	
	>20	58 (19.0)	11 (21.0)	41 (79.0)	
Medical speciality	No	112 (36.0)	7 (7.0)	91 (93.0)	<0.001
	General practice	20 (6.0)	3 (16.0)	16 (84.0)	
	Anesthesia	5 (2.0)	0 (0.0)	5 (100.0)	
	Surgery	8 (2.0)	1 (12.5)	7 (88.0)	
	Geriatrics	42 (14.0)	17 (45.0)	21 (55.0)	
	Gynecology	-	-	-	
	Internal medicine	87 (28.0)	31 (36.0)	54 (64.0)	
	Neurology	11 (4.0)	1 (14.0)	6 (86.0)	
	Orthopedy	15 (5.0)	1 (7.0)	13 (93.0)	
	Pediatric	-	-	-	
	Psychiatry	1 (1.0)	0 (0.0)	1 (100.0)	
	Urology	-	-	-	
	Others	5 (2.0)	0 (0.0)	5 (100.0)	
Certified in nutritional medicine	Yes	12 (4.0)	6 (56.0)	5 (44.0)	0.014
	No	285 (96.0)	52 (20.0)	210 (80.0)	

# Prevention, diagnosis and treatment of RFS

2. Prevention of RFS during Nutritional Therapy					
Risk stratification for RFS	No Risk	Low Risk 1 minor risk factor	High Risk 1 major or 2 minor risk factors	Very high risk: • BMI < 14 • Weight loss >20% • Starvation > 15 days	
Preventive measures before/during nutritional therapy	Correct the existing deficit of dehydration and replace previous or ongoing abnormal fluid losses (see Table 1): % dehydration x BW (kg) = volume to be replaced in L (rough estimate of fluid loss)				
	No other preventive measures needed	<b>Electrolyte substitution</b> if lower than normal* with adaption of daily dose according to serum levels: 1-1.5 mmol/kg/d potassium, 0.2-0.4 mmol/kg/d magnesium, 0.3-0.6 mmol/kg/d phosphate *Mg <0.70 - 0.75mmol/l, PO <sub>4</sub> <0.80mmol/l, K <3.5mmol/l <ul style="list-style-type: none"> <li>• Thiamine: 200-300mg on days 1-5</li> <li>• Multivitamins during days 1-10</li> <li>• Replace specific deficiency of trace elements</li> <li>• Sodium restriction (&lt;1 mmol/kg/d) for the days 1-7</li> </ul>			
Days 1-3*	Energy (by all routes): Full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 15-25 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 10-15 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 5-10 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	
Day 4*		Energy (by all routes): 30 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 15-25 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 10-20 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	
Day 5*		Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): 30 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)		Energy (by all routes): 20-30 kcal/kg/d (40-60% carbohydrates, 30-40% fat, 15-20% proteins)
Day 6*			Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)
Days 7-9*				Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)
> 10 Days*		Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)	Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)		Energy (by all routes): full requirements (40-60% carbohydrates, 30-40% fat, 15-20% proteins)
* individual clinical judgment is recommended for deciding the best rate to increase nutritional support in order to reach the full target in all three phases of the replenishment/feeding period.					
Fluids	No restriction in fluids	Fluids to maintain zero balance, approx. 30-35ml/kg/d	Fluids to maintain zero balance, D1-3 25-30ml/kg/d, >D4 30-35ml/kg/d	Fluids to maintain zero balance, D1-3 20-25ml/kg/d, D4-6 25-30ml/kg/d, >D7 25-35ml/kg/d	
Salt	No restriction in salt intake	No restriction in salt intake	Restrict Na to <1mmol/kg/d (D1-7)	Restrict Na to <1mmol/kg/d (D1-10)	
Iron	No iron substitution within the first 7 days even if patients have iron deficiency				
Monitoring	<ul style="list-style-type: none"> <li>• Serum electrolyte levels daily up to day 3, then every 2-3 days</li> <li>• Daily clinical examination focusing on hydration status</li> <li>• Continuous monitoring of the cardiac rhythm or electrocardiogram daily in patients at very high risk for RFS</li> </ul>				