

慢性腎臟病與肌少症

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大綱

1. 肌少症簡介及定義
2. 慢性腎臟病肌少症的盛行與機轉
3. 慢性腎臟病肌少症的預後
4. 慢性腎臟病肌少症的預防

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肌少症 (Sarcopenia)

- I. H. Rosenberg 提出 (Irwin H. Rosenberg, 1989)

- ✓ “Sarx(肌肉)”與“penia(缺乏)”的組合
- ✓ 隨著老化過程，肌肉質量的逐漸下降

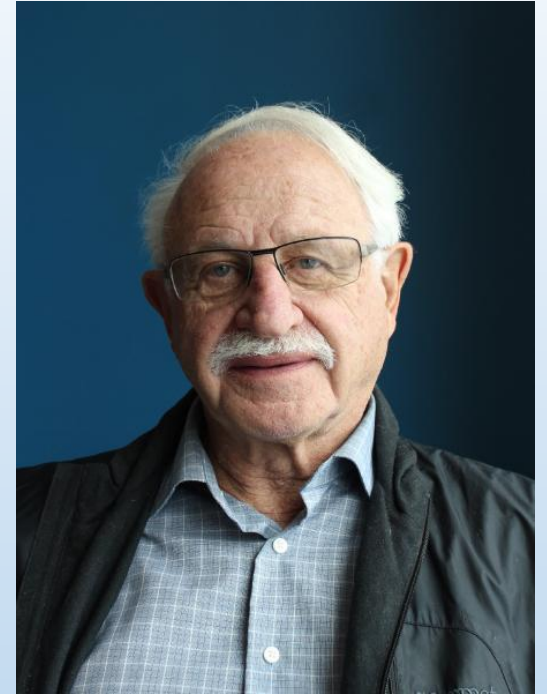
- 預測老年人住院及死亡的風險

(Arango-Lopera et al., 2013; Landi et al., 2013; J. H. Kim et al., 2014)

- 隨著世界人口的加速老化，日益受到重視

- Internal Classification of Disease, ICD-10-CM: *M62.84*

(Anker et al., 2016)



2010 歐洲老年肌少症工作小組

European Working Group on Sarcopenia in Older People, EWGSOP

Table 1. Criteria for the diagnosis of sarcopenia

Diagnosis is based on documentation of criterion 1 plus (criterion 2 or criterion 3)

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1. **Low muscle mass**
 2. Low muscle strength
 3. Low physical performance
-

Available clinical tools for skeletal muscle mass measurement

Tools	Accuracy	Cost	Radiation	Fat infiltration assessment	Operator-dependent	Clinical feasibility
MAMC	++	Low	No	No	Yes	High
BIA	+++	Low	No	No	No	High
DEXA	++++	Moderate	low	No	No	High
CT	++++	High	High	Yes	No	Low
MRI	++++	High	No	Yes	No	Low
Ultrasound	++	Low	No	Yes	Yes	High

MAMC: Mid-arm muscle circumference, BIA: Bioelectrical impedance analysis, DEXA: Dual-energy X-ray absorptiometry, CT: Computed tomography, MRI: Magnetic resonance imaging

Consensus definitions for geriatric sarcopenia

Measures	EWGSOP 2019 [78]	AWGS 2019 [9]	FNIH 2014 [37]	IWGS 2011 [36]
Skeletal muscle mass	ASM:	ASMI (BIA):	ASM:	ASMI (DEXA):
	Male <20 kg	Male <7.0 kg/m ²	Male <19.75 kg	Male <7.23 kg/m ²
	Female <15 kg	Female <5.7 kg/m ²	Female <15.02 kg	Female <5.67 kg/m ²
	ASMI:	ASMI (DEXA):	ASM/BMI:	
Male <7.0 kg/m ²	Male <7.0 kg/m ²	Male <0.789		
Female <6.0 kg/m ²	Female <5.4 kg/m ²	Female <0.512		
Muscle strength	HGS:	HGS:	HGS:	
	Male <27 kg	Male <28 kg	Male <26 kg	—
	Female <16 kg	Female <18 kg	Female <16 kg	
			HGS/BMI:	
		Male <1.0		
		Female <0.56		
Usual gait speed (m/s)	≤0.8	<1.0	≤0.8	<1.0
Other physical performances	SPPB ≤8	SPPB ≤9		
	5-time STS >15 s	5-time STS ≥12 s	—	—
	TUG ≥20 s			
	400 m walk test ≥6 min or non-completion			
Screening tools	SARC-F ≥4	Calf circumference:		
		Male <34 cm	—	—
		Female <33 cm		
		SARC-F ≥4		
	SARC-CalF ≥11			

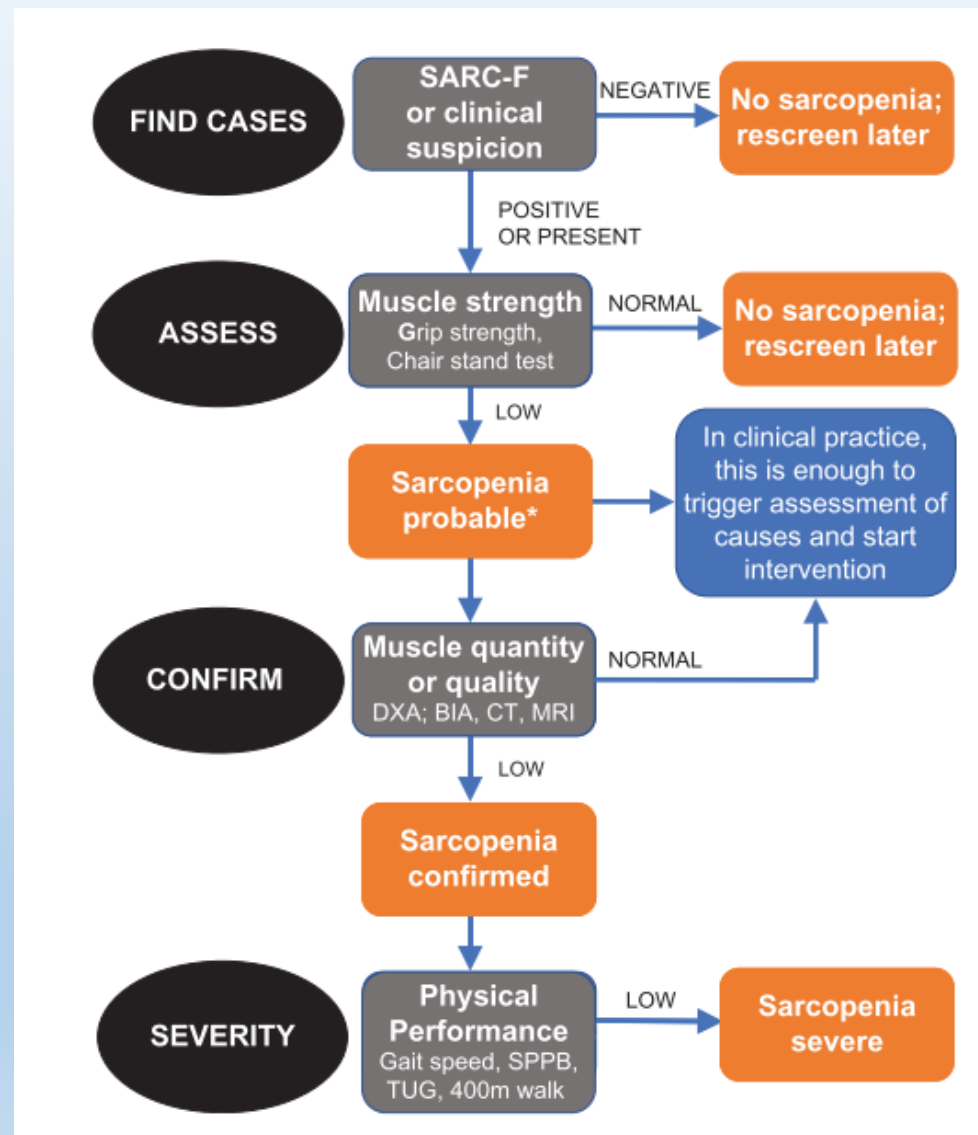
EWGSOP, European Working Group on Sarcopenia in Older People;
 AWGS, Asian Working Group for Sarcopenia;
 FNIH, Foundation for the National Institutes of Health;
 IWGS, International Working Group on Sarcopenia;
 ASM, appendicular skeletal muscle;
 ASMI, appendicular skeletal muscle index;
 BMI, body mass index;
 HGS, handgrip strength;
 SPPB, Short Physical Performance Battery;
 STS, sit-to-stand test;
 TUG, time Up and Go test.

Revised European consensus on definition and diagnosis

【SARC-F 肌少症篩檢問卷表】

評估項目	題目	分數
肌力強度	您提 10 磅重物(約 4.5 公斤)有多困難？	完全沒困難 = 0
		有些困難 = 1
		非常困難或無法做到 = 2
行走	您走過一個房間有多困難？	完全沒困難 = 0
		有些困難 = 1
		非常困難、需使用輔助工具或無法做到 = 2
起身	您從椅子或床上起身有多困難？	完全沒困難 = 0
		有些困難 = 1
		非常困難或無法做到 = 2
登階	您爬 10 階樓梯有多困難？	完全沒困難 = 0
		有些困難 = 1
		非常困難或無法做到 = 2
跌倒	過去一年內您曾跌倒幾次？	未曾跌倒 = 0
		1-3 次 = 1
		4 次以上 = 2

SARC-F總分≥4分，代表肌少症高風險群



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慢性腎臟病為肌少症的高危險群

Table 2. Sarcopenia categories by cause

Primary sarcopenia

Age-related sarcopenia No other cause evident except ageing

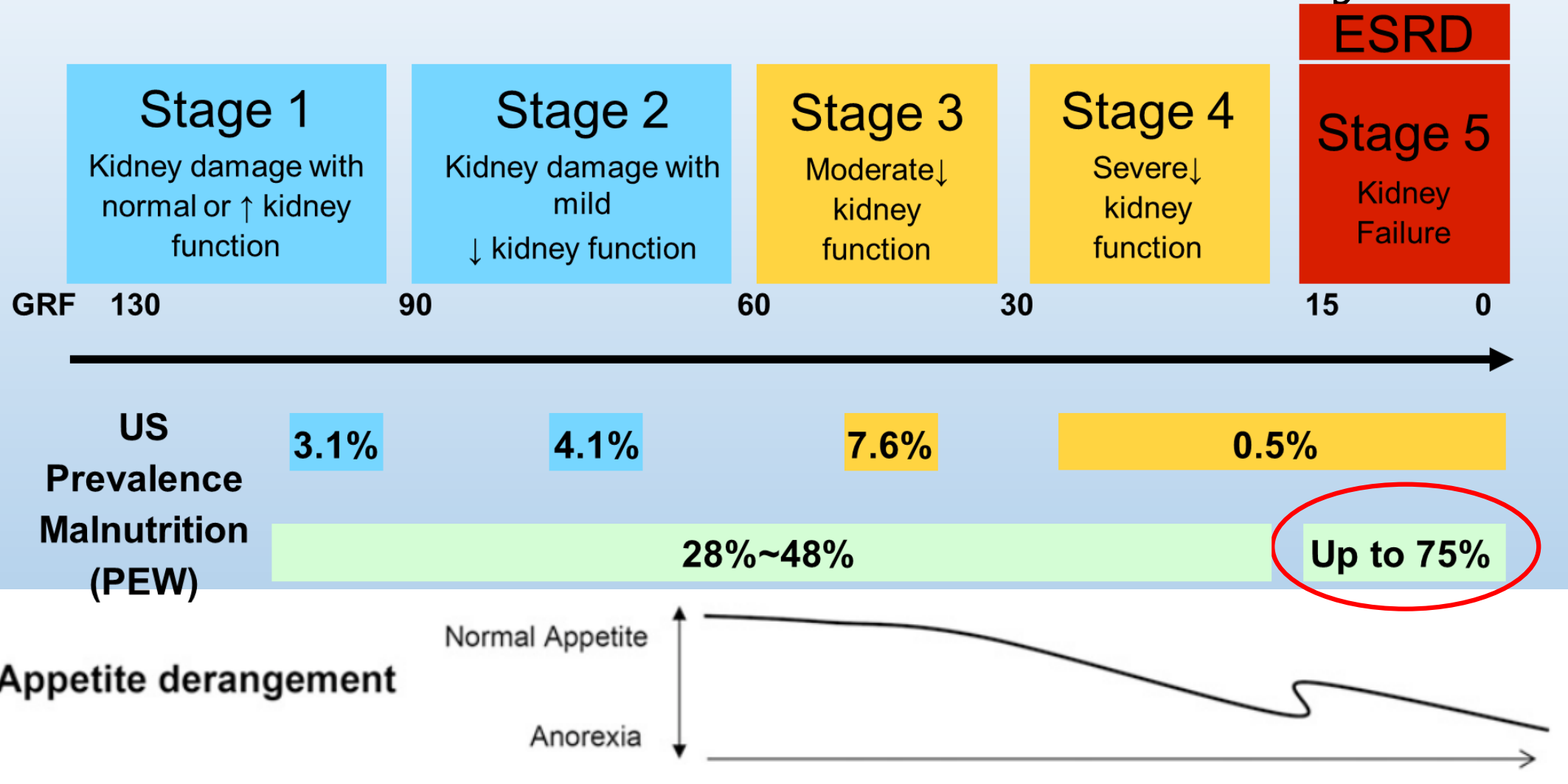
Secondary sarcopenia

Activity-related sarcopenia Can result from bed rest, sedentary lifestyle, deconditioning or zero-gravity conditions

Disease-related sarcopenia Associated with advanced organ failure (heart, lung, liver, kidney, brain), inflammatory disease, malignancy or endocrine disease

Nutrition-related sarcopenia Results from inadequate dietary intake of energy and/or protein, as with malabsorption, gastrointestinal disorders or use of medications that cause anorexia

28~75% of CKD Patients are Affected by PEW



PEW: Protein-energy wasting

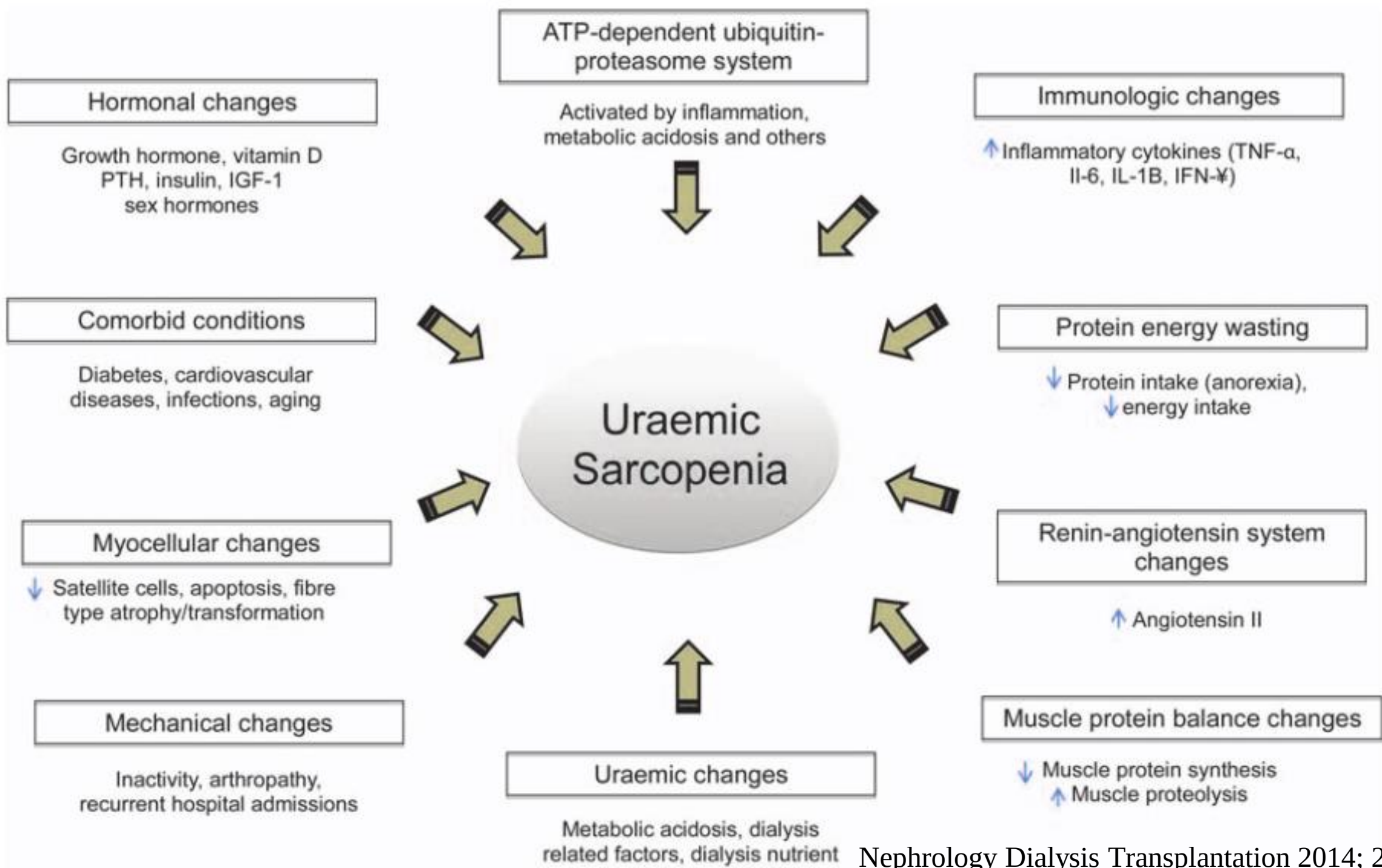
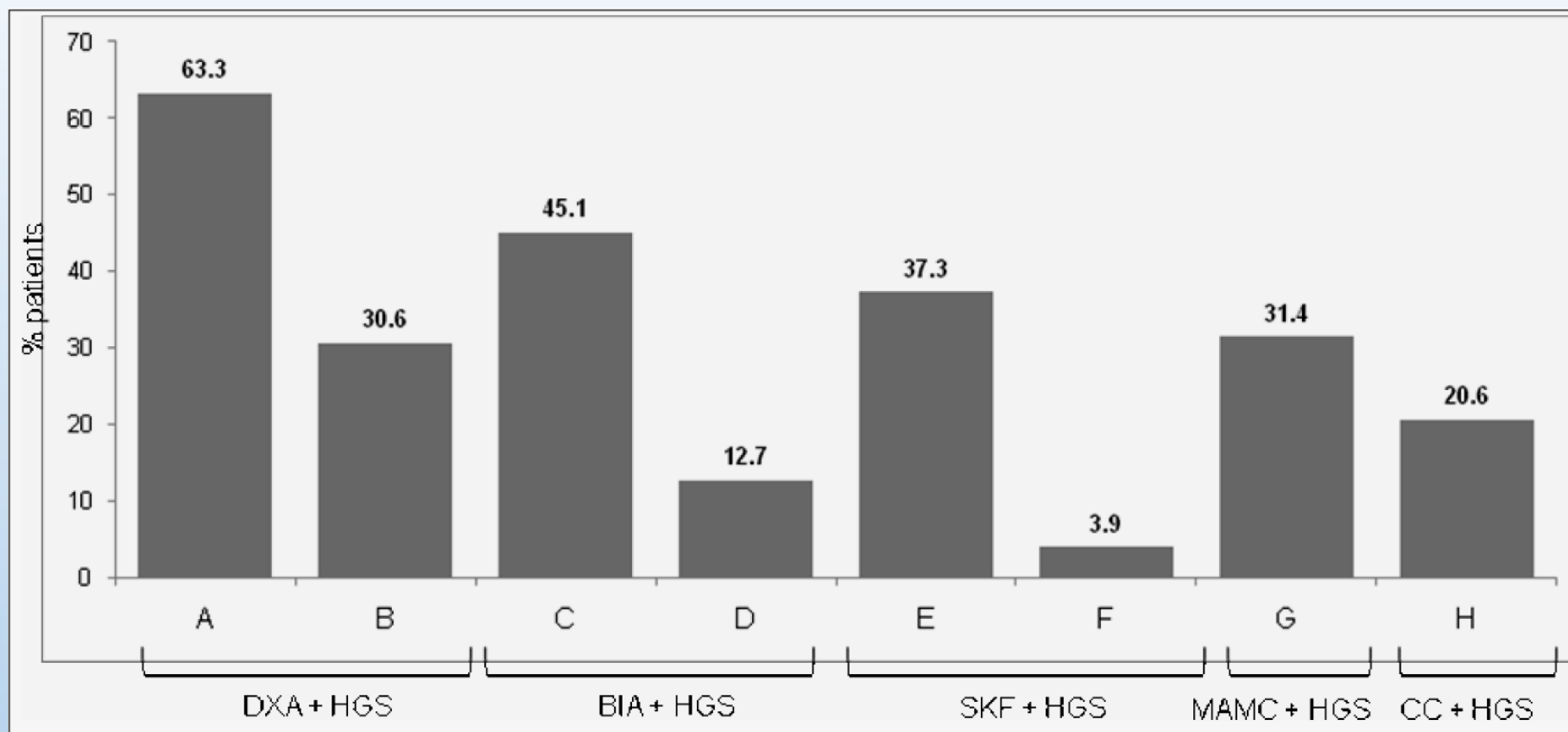


Table 1. Aetiology of muscle wasting in sarcopenia and CKD

Sarcopenia	CKD
<ul style="list-style-type: none"> • Increase in proinflammatory cytokines 	<ul style="list-style-type: none"> • Increase in proinflammatory cytokines
<ul style="list-style-type: none"> • Decreased protein intake 	<ul style="list-style-type: none"> • Muscle protein imbalance
<ul style="list-style-type: none"> • Decline in exercise 	<ul style="list-style-type: none"> • Inactivity
<ul style="list-style-type: none"> • Decrease sex hormones 	<ul style="list-style-type: none"> • Decrease sex hormones
<ul style="list-style-type: none"> • Decreased Growth hormone 	<ul style="list-style-type: none"> • Growth hormone resistance
<ul style="list-style-type: none"> • Decreased insulin 	<ul style="list-style-type: none"> • Insulin resistance
<ul style="list-style-type: none"> • Decrease vitamin D 	<ul style="list-style-type: none"> • Vitamin D abnormalities
<ul style="list-style-type: none"> • Decline in satellite cells 	<ul style="list-style-type: none"> • Decline in satellite cells
	<ul style="list-style-type: none"> • Metabolic acidosis
	<ul style="list-style-type: none"> • Angiotensin II
	<ul style="list-style-type: none"> • PEW
	<ul style="list-style-type: none"> • Myostatin overexpression



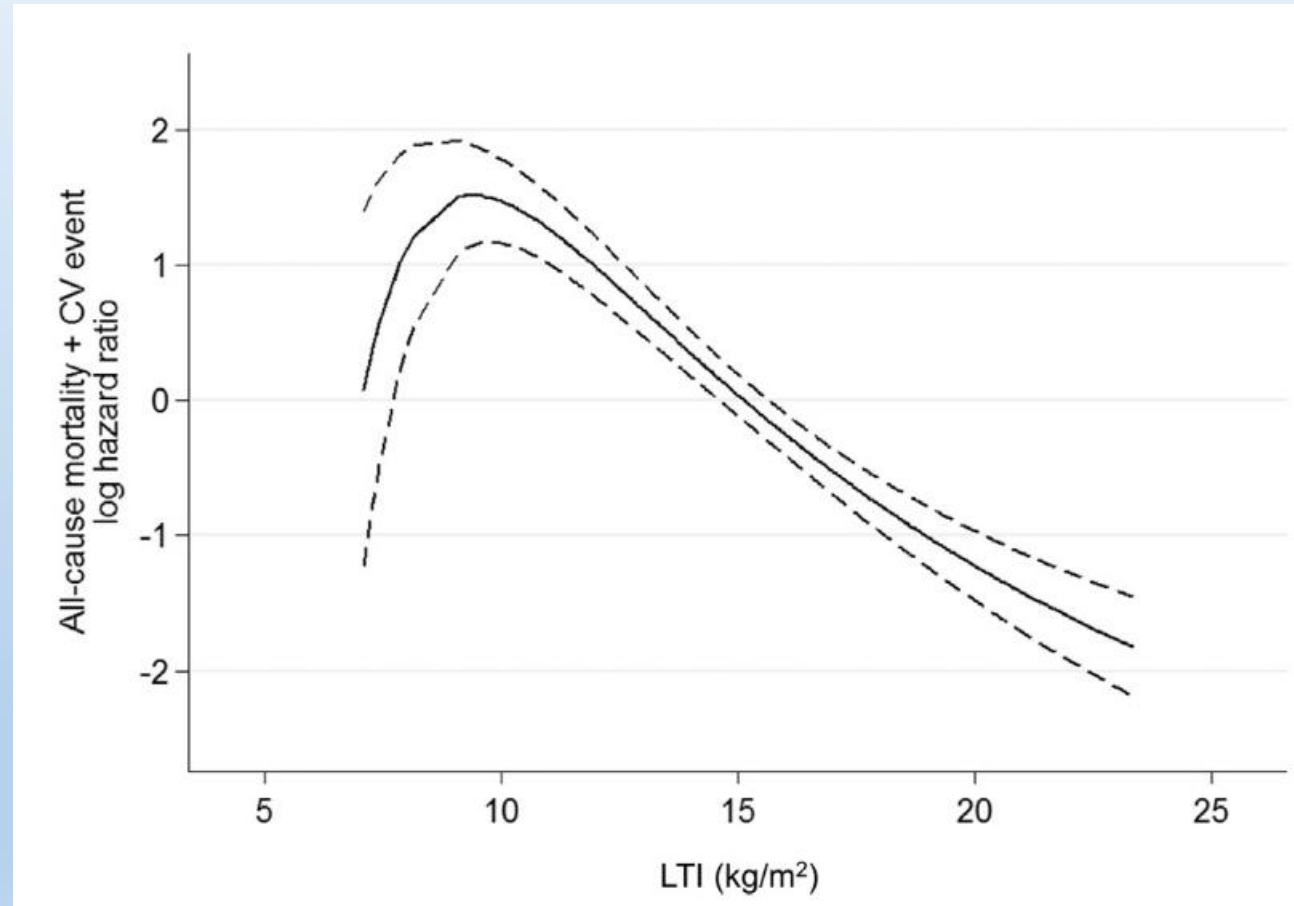
- 在末期腎臟疾病病患中，肌少症的盛行率:14%至63%
- 尿毒肌少症的診斷目前仍缺乏共識。

(J. K. Kim et al., 2014; Lamarca et al., 2014; Ren et al., 2016)

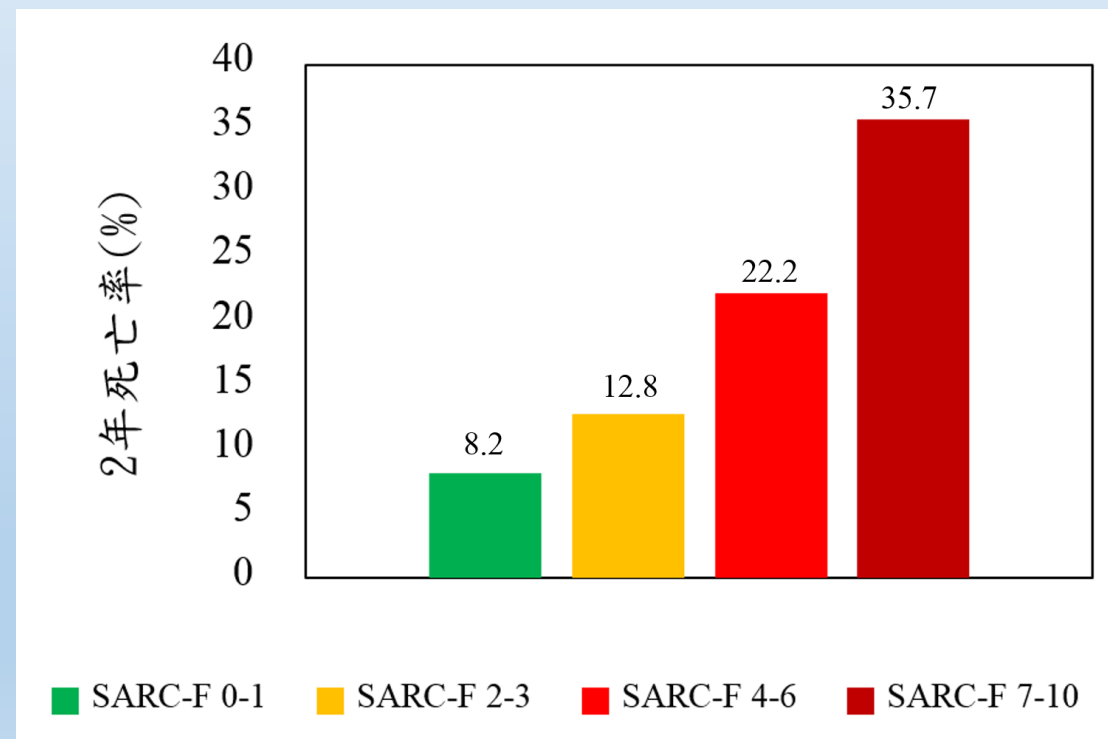
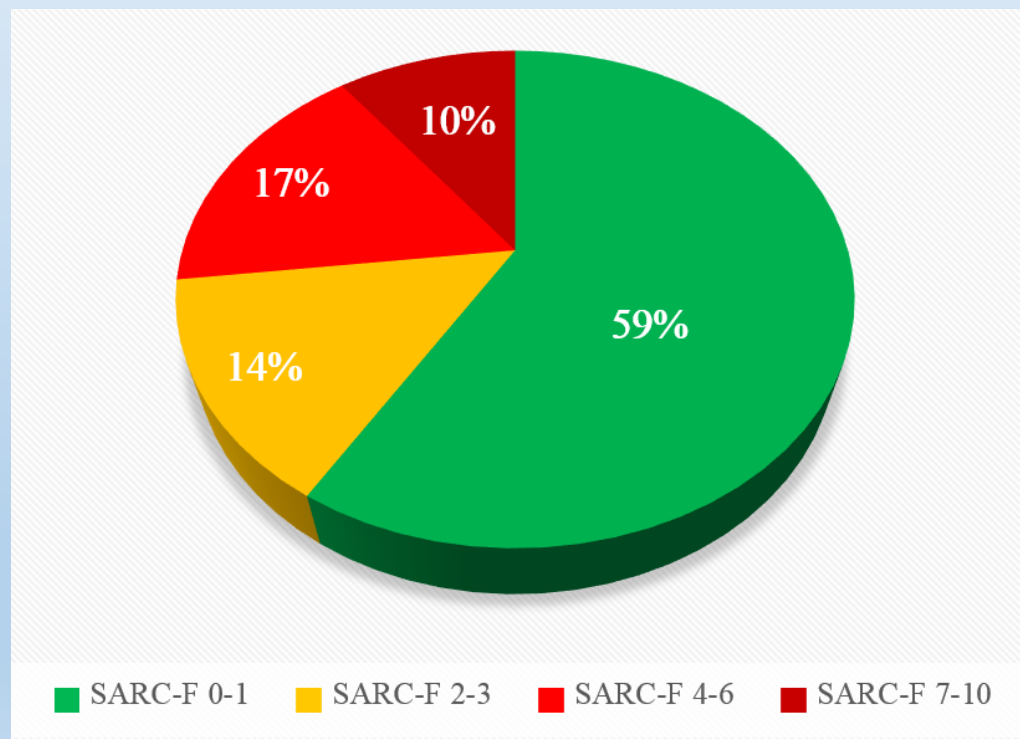
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慢性腎臟病患肌肉質量與死亡風險相關

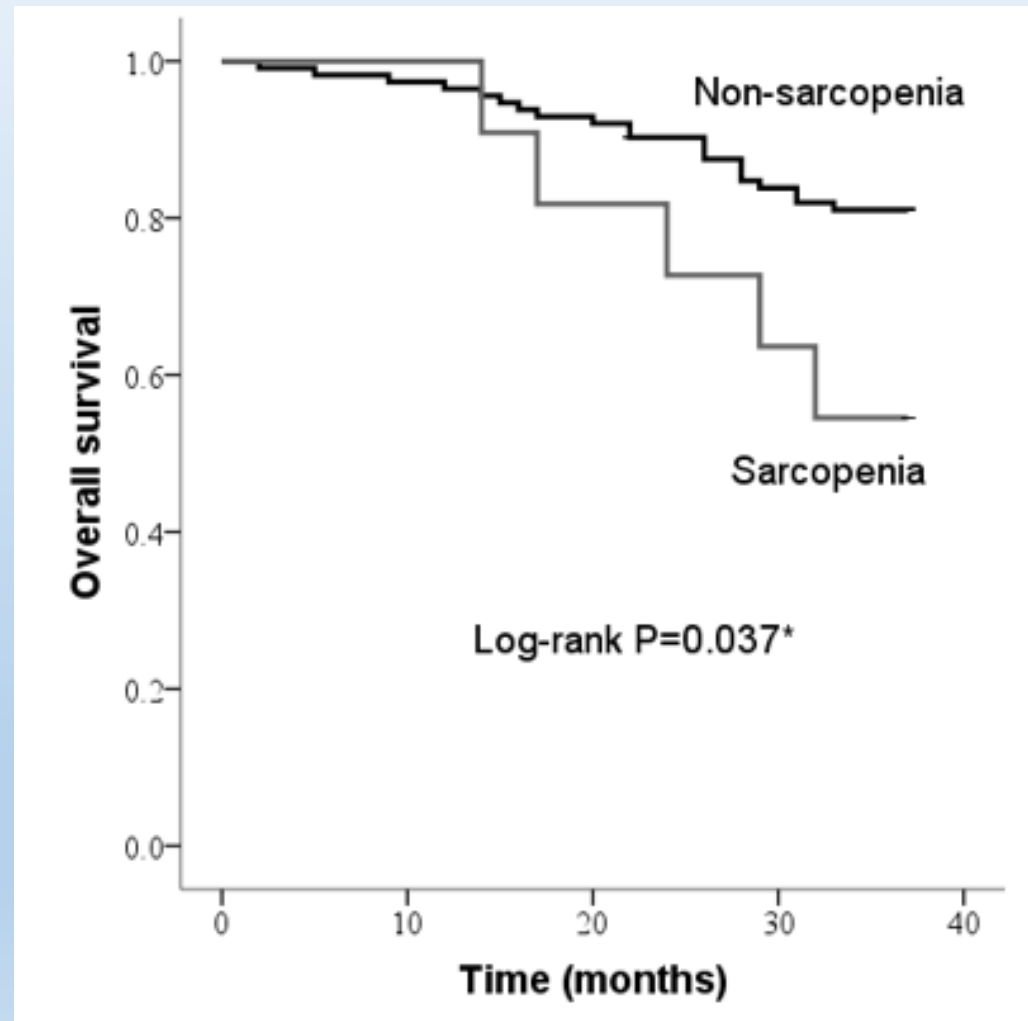


血液透析病患SARC-F與死亡率相關



(2018 HD cohort in Hualien Tzu-Chi Hospital, N=272)

血液透析病患肌少症與死亡率相關



(N=126)

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如何預防肌少症？

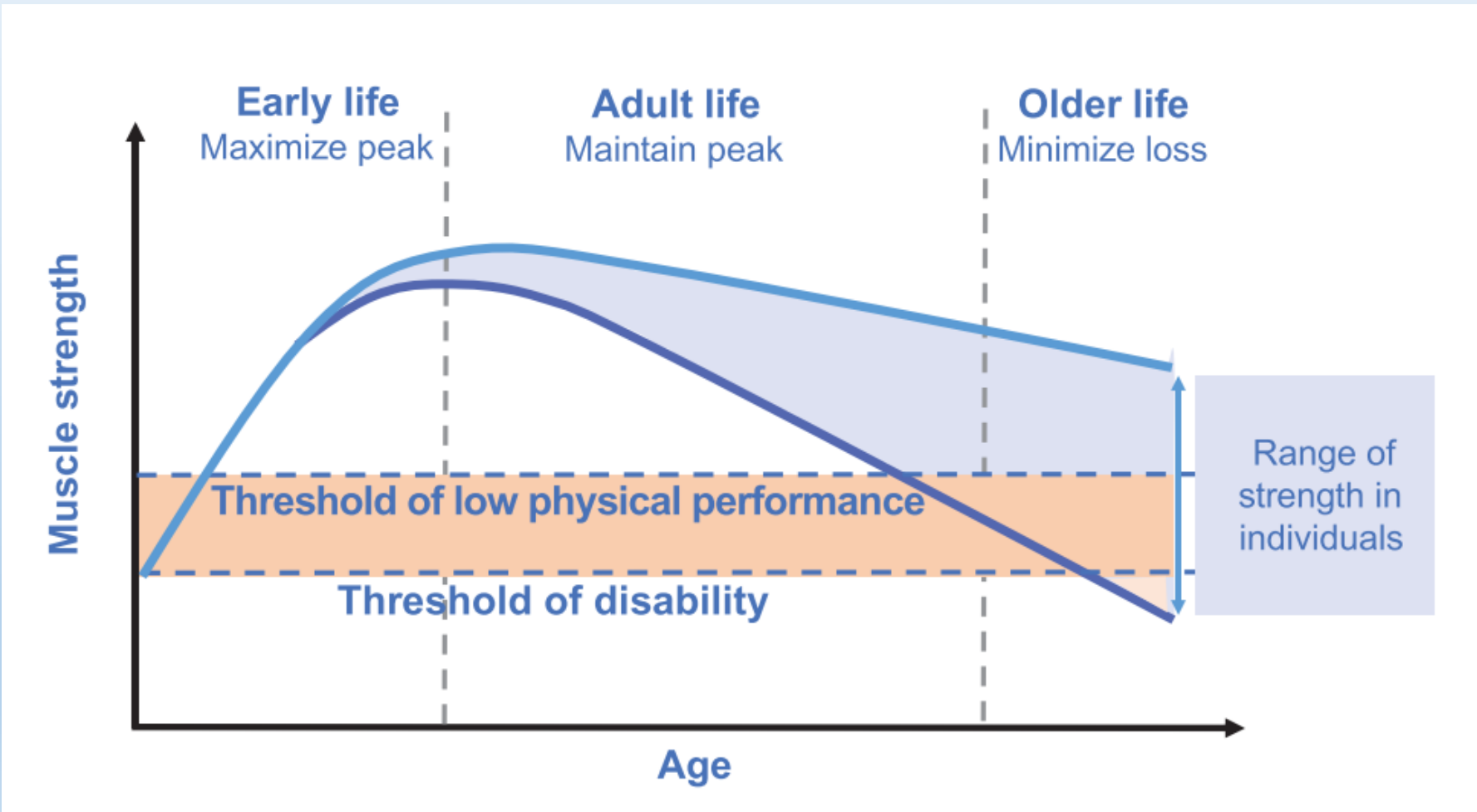


Table 1. Established, emerging and potential novel future treatment strategies for uremic muscle loss

A. Established treatment strategies of muscle loss

Nutritional supplementation [36]

Correction of acidosis with sodium bicarbonate [37]

Physical exercise [19–21]

Treatment of comorbidities that promote muscle mass loss, such as CHF, malignancies, depression and infections [7]

Avoid glucocorticoid treatment [38]

B. Emerging treatment strategies of muscle loss

Testosterone, androgens [7, 39]

Vitamin D [40]

GH (rhGH) [41, 42]

C. Potential future treatment strategies of muscle loss

Stimulation of mitochondrial biogenesis (sirtuins) [43]

miRNAs [6, 44]

Myogenic stem (satellite) cells [45]

Manipulation of TGF- β superfamily members, such as inhibition of GDF8 and stimulation of GDF11 [46, 47]

Targeting pro-inflammatory cytokines, such as IL-1, IL-6 and TNF [7, 48]

Targeting the epigenome [49]

Dr. Mc
180
慢性腎臟病
復健運動全書

全彩圖解
字體加大版

慢性腎臟病

最強 科學實證

復健運動全書

專家群示範指導，逆轉腎病變，改善肌少症、提升心肺代謝功能

1 肌力
2 心肺耐力
3 動作神經控制力
4 柔軟度

運動的基本原則
培養身體4大健康機能

醫學科學實證
培養「肌力、心肺耐力、動作神經控制能力、柔軟度」身體4大健康機能，進行有氧運動、阻力訓練、合併平衡感、步態訓練等，每週運動至少3次，每次30分鐘以上，可以顯著增加慢性腎臟病患者的肌肉量，並且能提升生活功能與品質，避免跌倒機率發生，同時可提升腎臟功能，降低體液中發炎因子，延緩慢性腎臟病進展。

花蓮慈濟醫學中心
腎臟科及復健醫學部
及復健科醫師團隊

王登賢醫師

原水文化

運動是預防肌少症的不二法門

(2) 啞鈴肩推

運動益處 | 訓練肩膀三角肌、上臂三頭肌、斜方肌、旋轉肌，保護肩膀不容易受傷，更能改善肩頸緊繃與駝背姿勢。

健身用品 | 訓練器（如水瓶或小啞鈴），建議強度是可以重複十次會累的重量，太輕沒有效果，太重的話手會受傷。



STEP1
深坐姿，可以坐在地上或是椅子上。身體坐正微挺胸，雙臂外展，與手肘維持90度，手掌面向前方握住訓練器。



STEP2
手臂垂直向上，將訓練器互相靠近，直到手臂打直，速度要穩定不要過快，再慢慢回到起始姿勢。



(3) 二頭肌彎曲

運動益處 | 訓練上臂二頭肌，手臂更有力，搬重物也不怕。

健身用品 | 訓練器（如水瓶或小啞鈴），建議強度是可以重複十次會累的重量，太輕沒有效果，太重的話手會受傷。



STEP1
取一張椅腳較穩的椅子坐下，身體坐正微挺胸，雙手舉啞鈴，手臂自然下垂在身體兩側，雙腳踩穩地面。



STEP2
手心朝上握住啞鈴，往肩膀方向彎曲。



STEP3
速度要穩定不要過快，再慢慢回到起始姿勢。



健身運動小提醒：
可單手動作完成，再換另一手訓練。

慢性腎臟病患的飲食原則

- 限鹽 < 5g/day (鈉 < 2g/day)
- 適量的水份攝取
- 充足的熱量—30-35 kcal/kg/day
- 低鉀飲食
- 低磷飲食—0.8-1g/day
- 適量的蛋白質攝取

何謂適量的蛋白質攝取？

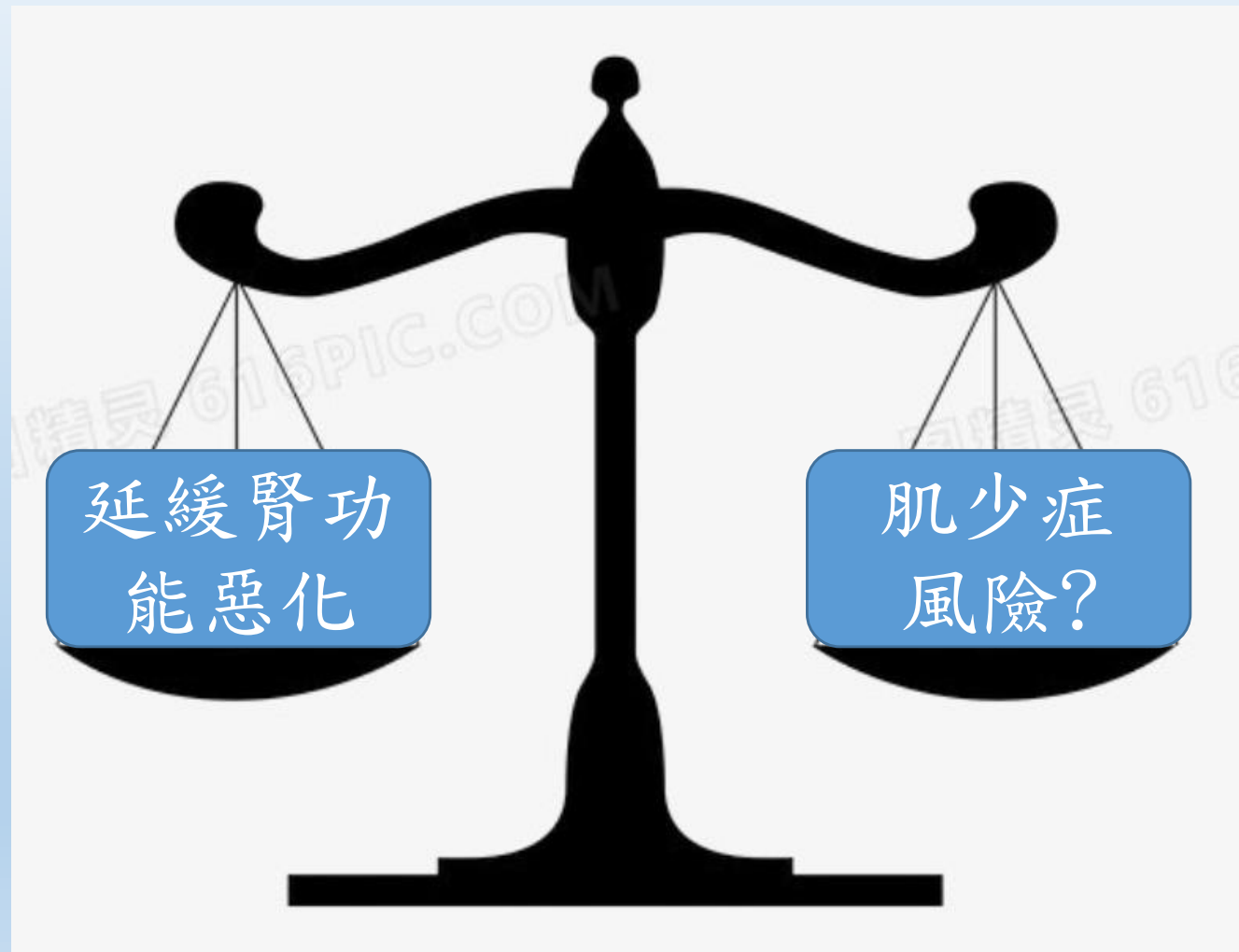
PATIENT CHARACTERISTICS	EXPERT-RECOMMENDED DPI
Patients with severe CKD ^{1,2}	0.6-0.8 g/kg BW + DEI of 30 kcal/kg BW
CKD patients on dialysis ^{1,2}	> 1.2 g/kg BW
CKD patients with multiple morbidities ^{1,2}	Unrestricted intake of dietary protein
Acute kidney injury patients ²⁻⁵	1.5–2.5 g/kg BW

- > 50% 的蛋白質攝取需來自於高生物價蛋白(high biological value protein)
- 足夠的熱量攝取是預防體內蛋白質分解的關鍵

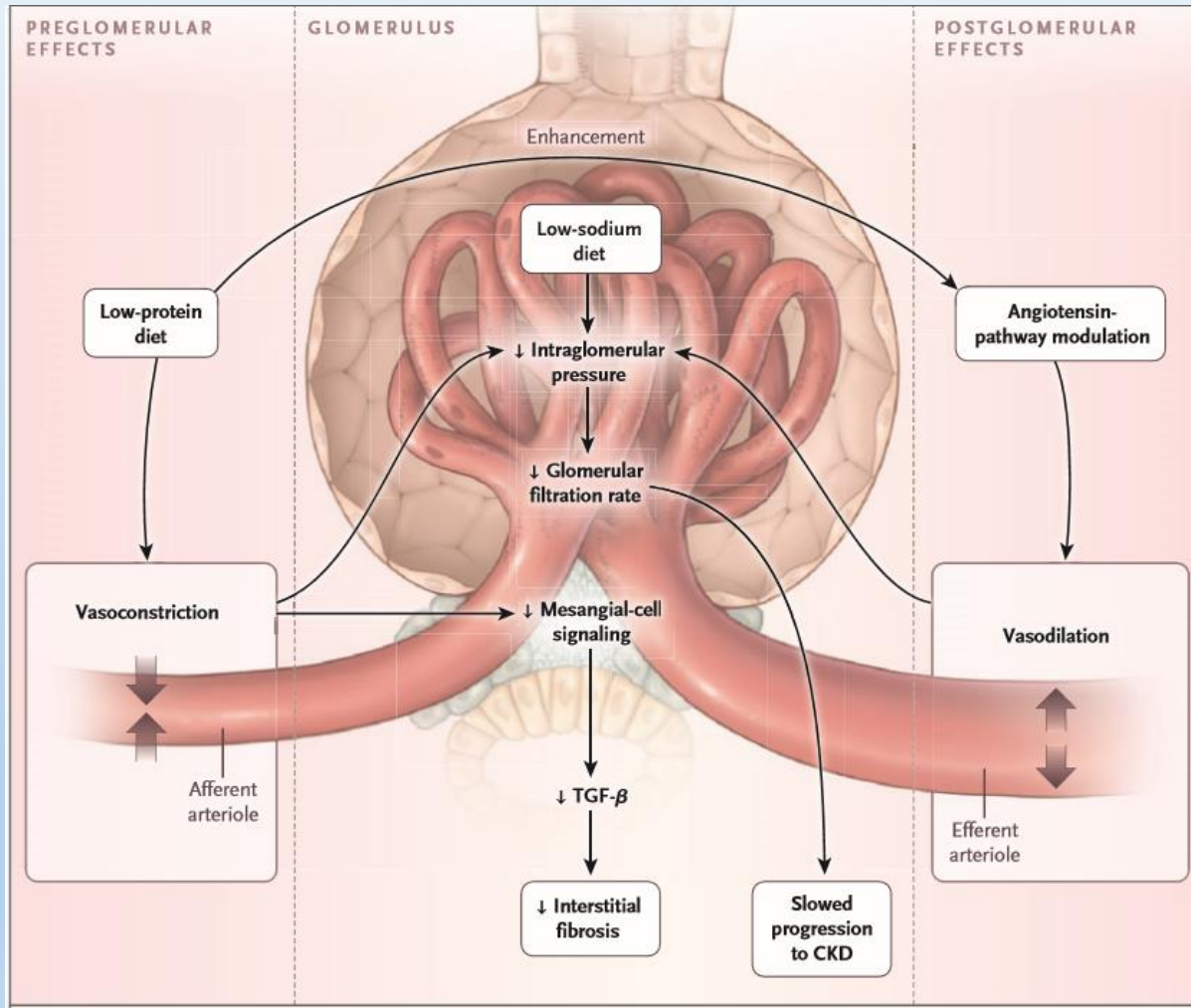
1. Ikizler et al. Kidney Int 2013; 84:1096-107.
2. Deutz NE et al. Clin Nutr 2014; 33:929-36.
3. Wolfe RR et al. Clin Nutr 2008; 27:675-84.

4. Cano NJ et al. Clin Nutr 2009; 28:401-14.
5. Li Y et al. Cochrane Database Syst Rev 2010; (1):CD005426.

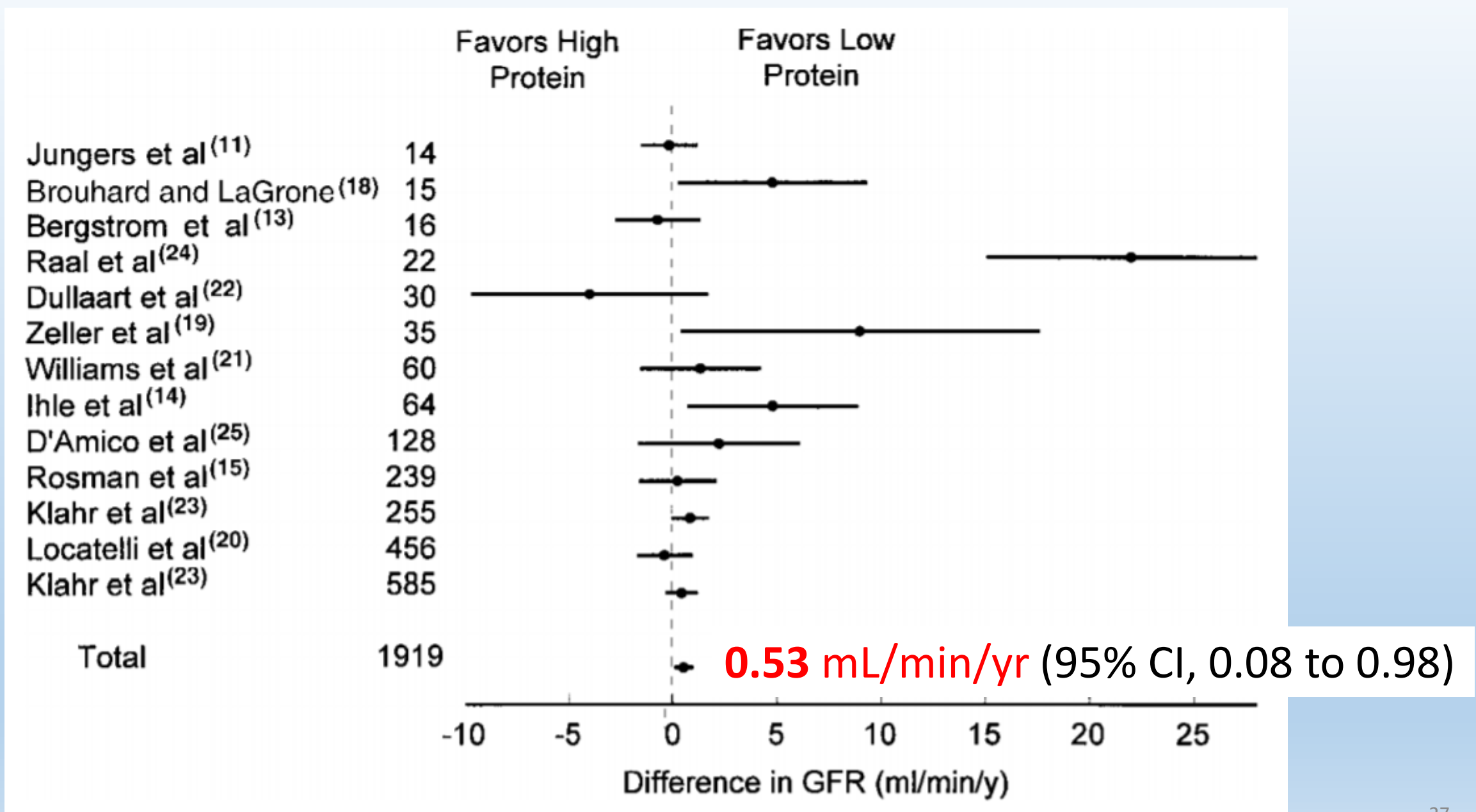
低蛋白飲食—利與弊



低蛋白飲食延緩腎功能衰退的機轉



1. 降低腎絲球壓力
2. 降低發炎物質的產生，減少腎臟纖維化



2015 臺灣慢性腎臟病臨床診療指引

表一

期別	腎絲球過濾率	建議蛋白質攝取量	酮酸療法
一	>/ 90	正常蛋白質攝取	不需要
二	60-89	正常蛋白質攝取	不需要
三	a. 45-59	每天每公斤體重 0.8 克蛋白質	不需要
	b. 30-44	每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
四	15-29	1. 每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
		2. 每天每公斤體重 0.3-0.6 克蛋白質	建議使用
五	<15 (尚未透析)	1. 每天每公斤體重 0.6-0.8 克蛋白質	* 考慮使用
		2. 每天每公斤體重 0.3-0.6 克蛋白質	建議使用

* 考慮使用：酮酸療法每天每五公斤體重一顆 Ketosteril，並視飲食中蛋白質的生物價值而調整。

KDOQI GUIDELINE FOR NUTRITION IN CKD: 2020 UPDATE

3.0 Statements on Protein Amount

Protein Restriction, CKD Patients Not on Dialysis and Without Diabetes

3.0.1 In adults with CKD 3-5 who are metabolically stable we recommend, under close clinical supervision, protein restriction with or without keto acid analogs, to reduce risk for end-stage kidney disease (ESKD)/death (1A) and improve quality of life (QoL) (2C):

- a low-protein diet providing 0.55–0.60 g dietary protein/kg body weight/day, or
- a very low-protein diet providing 0.28–0.43 g dietary protein/kg body weight/day with additional keto acid/amino acid analogs to meet protein requirements (0.55–0.60 g/kg body weight/day)

Protein Restriction, CKD Patients Not on Dialysis and With Diabetes

3.0.2 In the adult with CKD 3-5 and who has diabetes, it is reasonable to prescribe, under close clinical supervision, a dietary protein intake of 0.6-0.8 g/kg body weight per day to maintain a stable nutritional status and optimize glycemic control (OPINION).

限制蛋白質攝取的兩大前提：

1. 身體代謝狀態穩定(metabolically stable)
2. 密切的營養評估及監測

哪些病患不適合限制蛋白質的攝取？

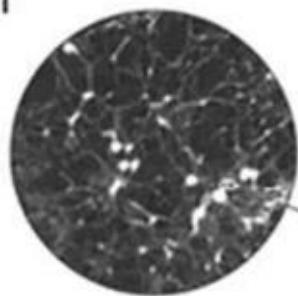
1. 患有發炎或感染性疾病
2. 兩週內有住院病史
3. 控制不佳的糖尿病
4. 患有癌症或其他消耗營養疾病
5. 正接受抗生素或免疫抑制藥物治療
6. 短期內(3-6個月)有顯著的體重流失者

Mood + cognitive function



Immune modulation

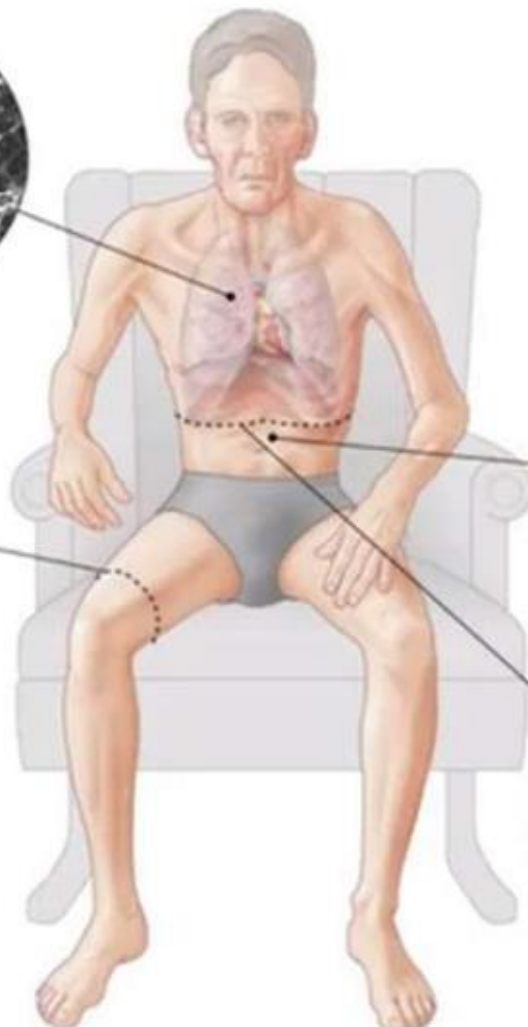
Hyperinflation



Protein balance



Mitochondrial metabolism



Bone mass



Gut function

感謝聆聽