Screening for malnutrition in CKD

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Background

- Malnutrition in ESKD is common
- In NSW RSC (2018 data)
  - Conservative patients – 35%
  - Symptom support – 52%

- **Nutritional screening** is a first-line process of identifying patients who may be at risk of becoming malnourished

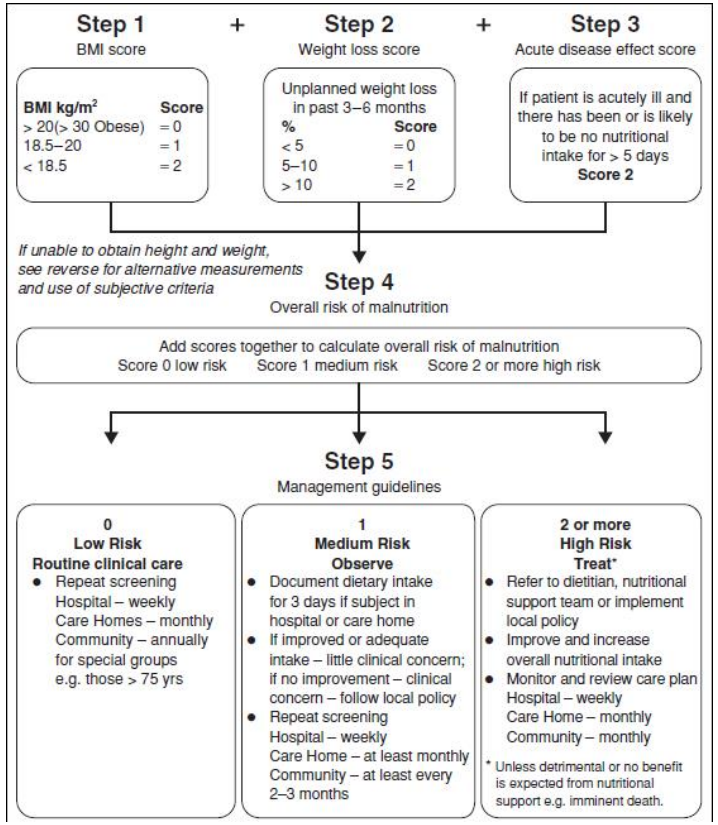
- **Nutritional assessment** is a detailed investigation to identify and quantify specific nutritional problems enabling a diagnosis of malnutrition

Common malnutrition screening tools

Malnutrition Screening Tool

1. Have you lost weight recently without trying?		
No	0	
Unsure	2	
If Yes, how much weight (kg) have you lost?		
1 – 5	1	
6 – 10	2	
11 – 15	3	
> 15	4	
Unsure	2	Weight Loss Score: ☐
2. Have you been eating poorly because of a decreased appetite?		
No	0	
Yes	1	Appetite Score: ☐
Total MST Score (weight loss + appetite scores)		☐

Malnutrition Universal Screening Tool



Mini Nutritional Assessment - SF

Screening

A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0 = severe decrease in food intake
1 = moderate decrease in food intake
2 = no decrease in food intake ☐

B Weight loss during the last 3 months
0 = weight loss greater than 3 kg (6.6 lbs)
1 = does not know
2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
3 = no weight loss ☐

C Mobility
0 = bed or chair bound
1 = able to get out of bed / chair but does not go out
2 = goes out ☐

D Has suffered psychological stress or acute disease in the past 3 months?
0 = yes 2 = no ☐

E Neuropsychological problems
0 = severe dementia or depression
1 = mild dementia
2 = no psychological problems ☐

F1 Body Mass Index (BMI) (weight in kg) / (height in m²) ☐
0 = BMI less than 19
1 = BMI 19 to less than 21
2 = BMI 21 to less than 23
3 = BMI 23 or greater ☐

Sensitivity of screening methods and malnutrition in CKD

Malnutrition Universal Screening Tool

- limited sensitivity to detect malnutrition; 13% and 54% [1, 2]

Malnutrition Screening Tool

- limited sensitivity to detect malnutrition; 49% [2]

[1] Kosters CM, Duvan A, Yucesan E, Zweers-van Essen H, van Hamersvelt H. Diagnostic accurary of PG-SGA and MUST in patients with chronic kidney diseases, a pilot. *Clinical Nutrition*, 2016;35(suppl 1):S91–2.
[2] Lawson C, Campbell KL, Dimakopoulos I, Dockrell M. 2011. Assess the validity and reliability of the MUST and MST nutrition screening tools in renal inpatients. *Journal of Renal Nutrition*, 2011;22(5)

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journal homepage: www.nutritionjrnl.com

Applied nutritional investigation

Sensitive and practical screening instrument for malnutrition in patients with chronic kidney disease

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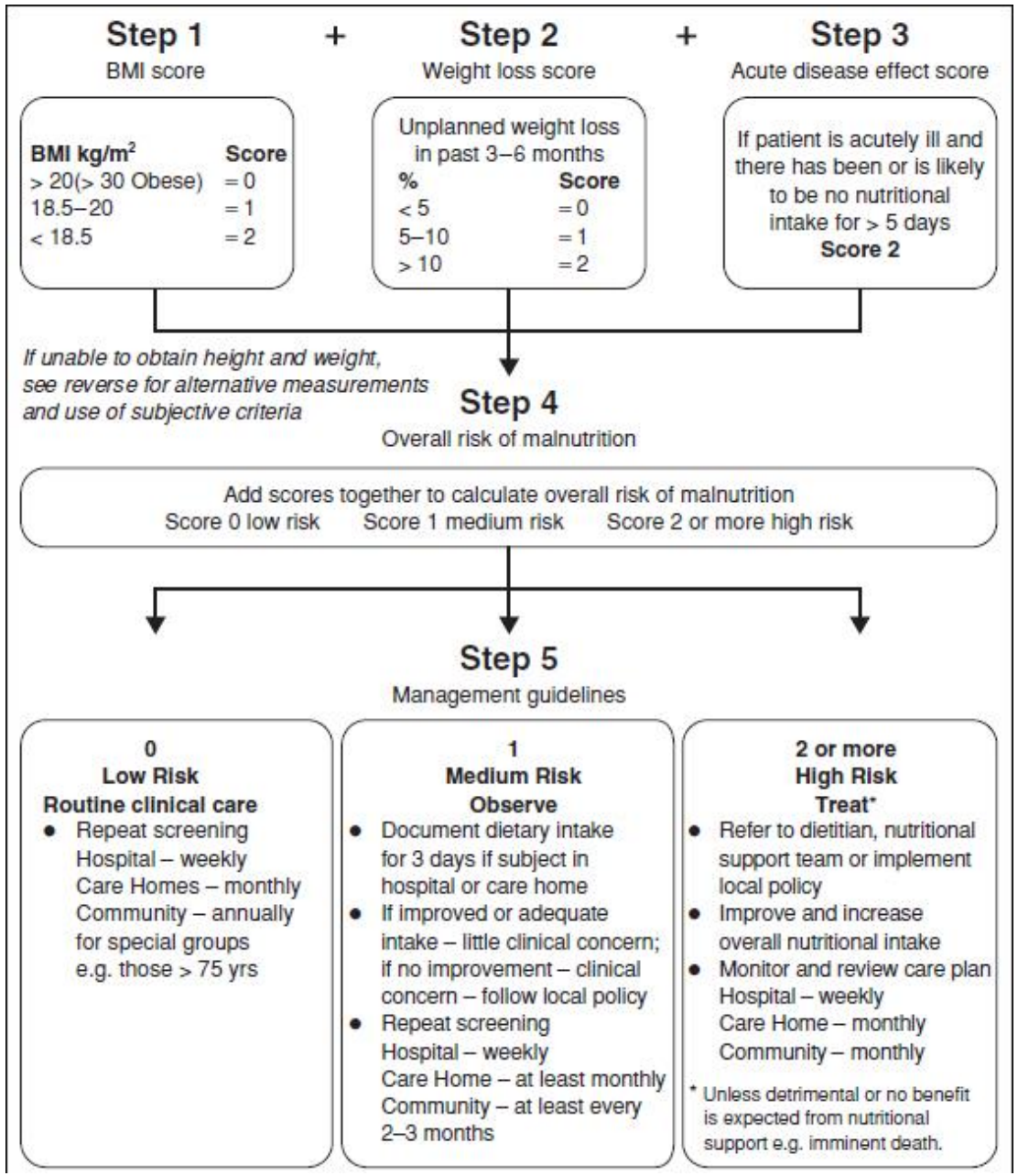
Aim:

- to examine the diagnostic accuracy of the MUST and the PG-SGA SF for malnutrition
- to assess the contribution of the different screening items of the MUST and the cPG-SGA to the explained variance in nutritional status as determined by the cPG-SGA score.
- to examine whether the PG-SGA-SF score, in combination with one of the items of the clinician's part of the cPG-SGA, can be used as a valid and compact nutrition assessment tool in patients with CKD.

Methods

- Cross-sectional observational study
- Inclusion criteria: patients treated for >3 mo with HD; CKD stage 5 NFD patients; patients on dialysis 1 to 4 weeks before living related kidney transplantation; renal inpatients (all stages of CKD)
- Patients completed the PG-SGA-SF independently, dietitians conducted cPG-SGA and MUST screen.
- PG-SGA-SF score ≥6 indicates at risk of malnutrition
- MUST ≥2 indicates at risk of malnutrition
- Complete PG-SGA ≥9 indicates malnutrition

MUST
nutrition risk rating



PG-SGA short form: nutrition risk rating

1. Weight *(See Worksheet 1)*

In summary of my current and recent weight:

I currently weigh about _____ kg
I am about _____ cm tall

One month ago I weighed about _____ kg
Six months ago I weighed about _____ kg

During the past two weeks my weight has:
☐ decreased (1) ☐ not changed (0) ☐ increased (0)

Box 1 ☐

2. Food Intake: As compared to my normal intake, I would rate my food intake during the past month as:
☐ unchanged (0)
☐ more than usual (0)
☐ less than usual (1)

I am now taking:
☐ *normal food* but less than normal amount (1)
☐ little solid food (2)
☐ only liquids (3)
☐ only nutritonal supplements (3)
☐ very little of anything (4)
☐ only tube feedings or only nutrition by vein (0)

Box 2 ☐

3. Symptoms: I have had the following problems that have kept me from eating enough during the past two weeks (check all that apply):
☐ no problems eating (0)
☐ no appetite, just did not feel like eating (3)
☐ nausea (1)
☐ constipation (1)
☐ mouth sores (2)
☐ things taste funny or have no taste (1)
☐ problems swallowing (2)
☐ pain; where? (2)_____
☐ other** (1) _____
☐ vomiting (3)
☐ diarrhea (2)
☐ dry mouth (1)
☐ smells bother me (1)
☐ feel full quickly (1)

** Examples: depression, money, or dental problems

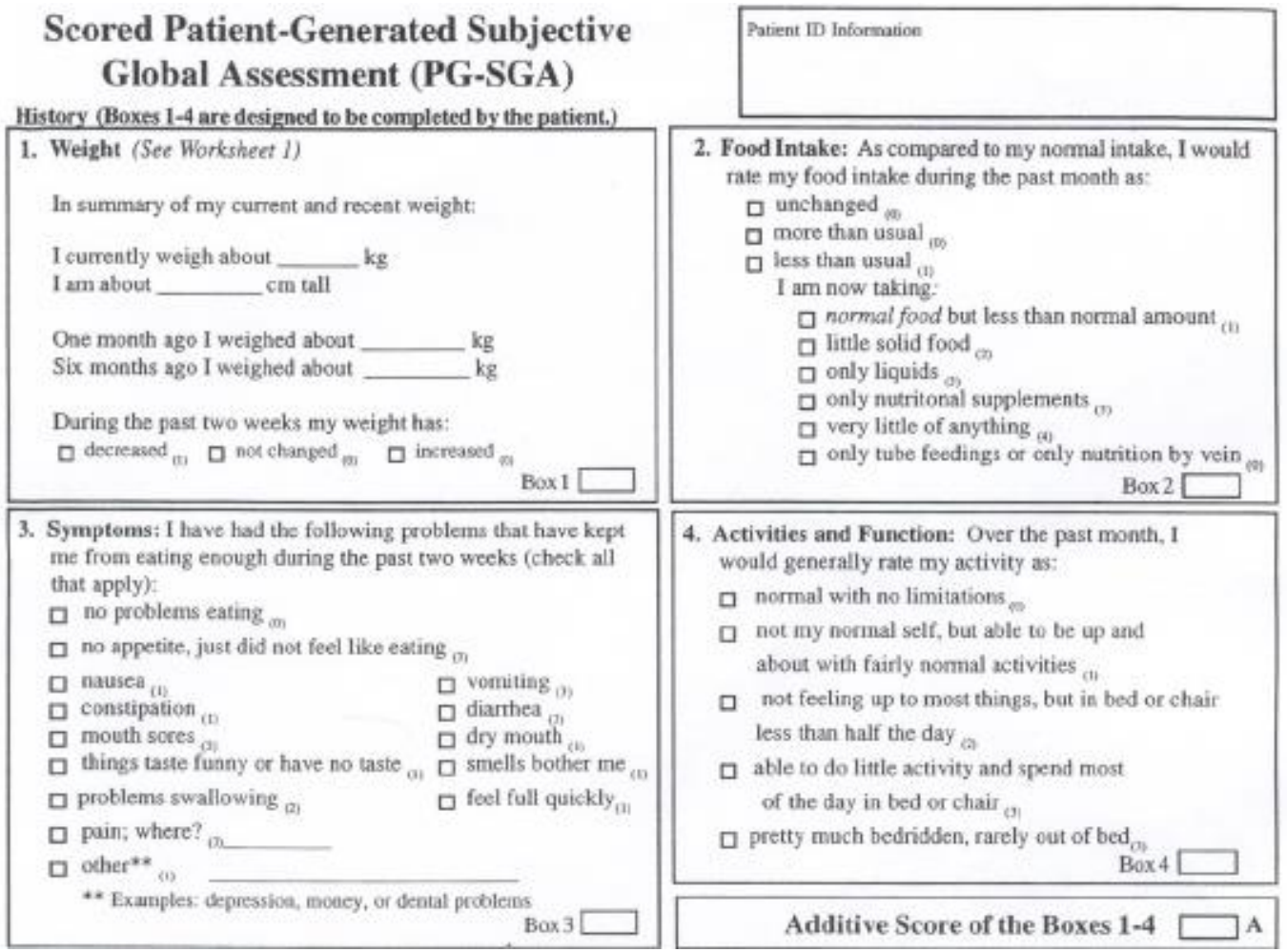
Box 3 ☐

4. Activities and Function: Over the past month, I would generally rate my activity as:
☐ normal with no limitations (0)
☐ not my normal self, but able to be up and about with fairly normal activities (1)
☐ not feeling up to most things, but in bed or chair less than half the day (2)
☐ able to do little activity and spend most of the day in bed or chair (3)
☐ pretty much bedridden, rarely out of bed (3)

Box 4 ☐

Additive Score of the Boxes 1-4 ☐ A

PG-SGA
nutrition assessment



Scored Patient-Generated Subjective Global Assessment (PG-SGA)

Patient ID Information

History (Boxes 1-4 are designed to be completed by the patient.)

1. Weight *(See Worksheet 1)*

In summary of my current and recent weight:

I currently weigh about _____ kg
I am about _____ cm tall

One month ago I weighed about _____ kg
Six months ago I weighed about _____ kg

During the past two weeks my weight has:
☐ decreased (1) ☐ not changed (0) ☐ increased (0)

Box 1 ☐

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Box 2 ☐

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☐ nausea (1)
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☐ mouth sores (3)
☐ things taste funny or have no taste (1)
☐ problems swallowing (2)
☐ vomiting (3)
☐ diarrhea (2)
☐ dry mouth (1)
☐ smells bother me (1)
☐ feel full quickly (1)
☐ pain; where? (3)_____
☐ other** (1) _____

** Examples: depression, money, or dental problems

Box 3 ☐

4. Activities and Function: Over the past month, I would generally rate my activity as:
☐ normal with no limitations (0)
☐ not my normal self, but able to be up and about with fairly normal activities (1)
☐ not feeling up to most things, but in bed or chair less than half the day (2)
☐ able to do little activity and spend most of the day in bed or chair (3)
☐ pretty much bedridden, rarely out of bed (3)

Box 4 ☐

Additive Score of the Boxes 1-4 ☐ A

Worksheet 1 - Scoring Weight (Wt) Loss

To determine score, use 1 month weight data if available. Use 6 month data only if there is no 1 month weight data. Use points below to score weight change and add one extra point if patient has lost weight during the past 2 weeks. Enter total point score in Box 1 of the PG-SGA.

Wt loss in 1 month	Points	Wt loss in 6 months
10% or greater	4	20% or greater
5-9.9%	3	10 -19.9%
3-4.9%	2	6 - 9.9%
2-2.9%	1	2 - 5.9%
0-1.9%	0	0 - 1.9%

Score for Worksheet 1 ☐
Record in Box I

Worksheet 2 - Scoring Criteria for Condition

Score is derived by adding 1 point for each of the conditions listed below that pertain to the patient.

Category	Points
Cancer	1
AIDS	1
Pulmonary or cardiac cachexia	1
Presence of decubitus, open wound, or fistula	1
Presence of trauma	1
Age greater than 65 years	1

Score for Worksheet 2 = ☐
Record in Box B

Worksheet 3 - Scoring Metabolic Stress

Score for metabolic stress is determined by a number of variables known to increase protein & calorie needs. The score is additive so that a patient who has a fever of > 102 degrees (3 points) and is on 10 mg of prednisone chronically (2 points) would have an additive score for this section of 5 points.

Stress	none (0)	low (1)	moderate (2)	high (3)
Fever	no fever	>99 and <101	≥101 and <102	≥102
Fever duration -	no fever	<72 hrs	72 hrs	> 72 hrs
Steroids	no steroids	low dose (<10mg prednisone equivalents/day)	moderate dose (≥10 and <30mg prednisone equivalents/day)	high dose steroids (≥30mg prednisone equivalents/day)

Score for Worksheet 3 = ☐
Record in Box C

Worksheet 4 - Physical Examination

Physical exam includes a subjective evaluation of 3 aspects of body composition: fat, muscle, & fluid status. Since this is subjective, each aspect of the exam is rated for degree of deficit. Muscle deficit impacts point score more than fat deficit. Definition of categories: 0 = no deficit, 1+ = mild deficit, 2+ = moderate deficit, 3+ = severe deficit. Rating of deficit in these categories are *not* additive but are used to clinically assess the degree of deficit (or presence of excess fluid).

Fat Stores:				
orbital fat pads	0	1+	2+	3+
triceps skin fold	0	1+	2+	3+
fat overlying lower ribs	0	1+	2+	3+
Global fat deficit rating	**0**	**1+**	**2+**	**3+**

Muscle Status:				
temples (temporalis muscle)	0	1+	2+	3+
clavicles (pectoralis & deltoids)	0	1+	2+	3+
shoulders (deltoids)	0	1+	2+	3+
interosseous muscles	0	1+	2+	3+
scapula (latissimus dorsi, trapezius, deltoids)	0	1+	2+	3+
thigh (quadriceps)	0	1+	2+	3+
calf (gastrocnemius)	0	1+	2+	3+
Global muscle status rating	**0**	**1+**	**2+**	**3+**

Fluid Status:				
ankle edema	0	1+	2+	3+
sacral edema	0	1+	2+	3+
ascites	0	1+	2+	3+
Global fluid status rating	**0**	**1+**	**2+**	**3+**

Point score for the physical exam is determined by the overall subjective rating of total body deficit.

No deficit	score = 0 points
Mild deficit	score = 1 point
Moderate deficit	score = 2 points
Severe deficit	score = 3 points

Score for Worksheet 4 = ☐
Record in Box D

Worksheet 5 - PG-SGA Global Assessment Categories

Category	Stage A Well-nourished	Stage B Moderately malnourished or suspected malnutrition	Stage C Severely malnourished
Weight	No wt loss OR Recent non-fluid wt gain	-5% wt loss within 1 month (or 10% in 6 months) OR No wt stabilization or wt gain (i.e., continued wt loss)	> 5% wt loss in 1 month (or >10% in 6 months) OR No wt stabilization or wt gain (i.e., continued wt loss)
Nutrient Intake	No deficit OR Significant recent improvement	Definite decrease in intake	Severe deficit in intake
Nutrition Impact Symptoms	None OR Significant recent improvement allowing adequate intake	Presence of nutrition impact symptoms (Box 3 of PG-SGA)	Presence of nutrition impact symptoms (Box 3 of PG-SGA)
Functioning	No deficit OR Significant recent improvement	Moderate functional deficit OR Recent deterioration	Severe functional deficit OR recent significant deterioration
Physical Exam	No deficit OR Chronic deficit but with recent clinical improvement	Evidence of mild to moderate loss of SQ fat &/or muscle mass &/or muscle tone on palpation	Obvious signs of malnutrition (e.g., severe loss of SQ tissues, possible edema)

Global PG-SGA rating (A, B, or C) = ☐

Results

- N=123 (68 outpatients, 55 inpatients)

- Modality
  - Dialysis n=64 (88% outpatients, 12% inpatients)
  - Non-dialysis n=59 (20% outpatients, 80% inpatients)

- Nutritional status (PG-SGA)
  - 56% well nourished (average age 58 years)
  - 44% malnourished (average age 66 years)

Results

Table 2
Accuracy of the MUST score ≥2 and the PG-SGA-SF score ≥6 to detect malnutrition as defined by a complete PG-SGA ≥9

	MUST ≥2	PG-SGA-SF ≥6
Sensitivity (95% CI)	24 (13–38)	0.78 (0.64–0.88)
Specificity (95% CI)	94 (86–98)	0.94 (0.86–0.98)
Positive predictice value (95% CI)	76 (50–93)	0.91 (0.79–0.98)
Negative predictive value (95% CI)	61 (51–71)	0.84 (0.74–0.92)

MUST, Malnutrition Universal Screening Tool; PG-SGA-SF, Patient-Generated Subjective Global Assessment Short Form.

Overall accuracy (AUC)

- MUST 0.63 (0.54-0.72)
- PG-SGA-SF 0.87 (0.8-0.92)

Results

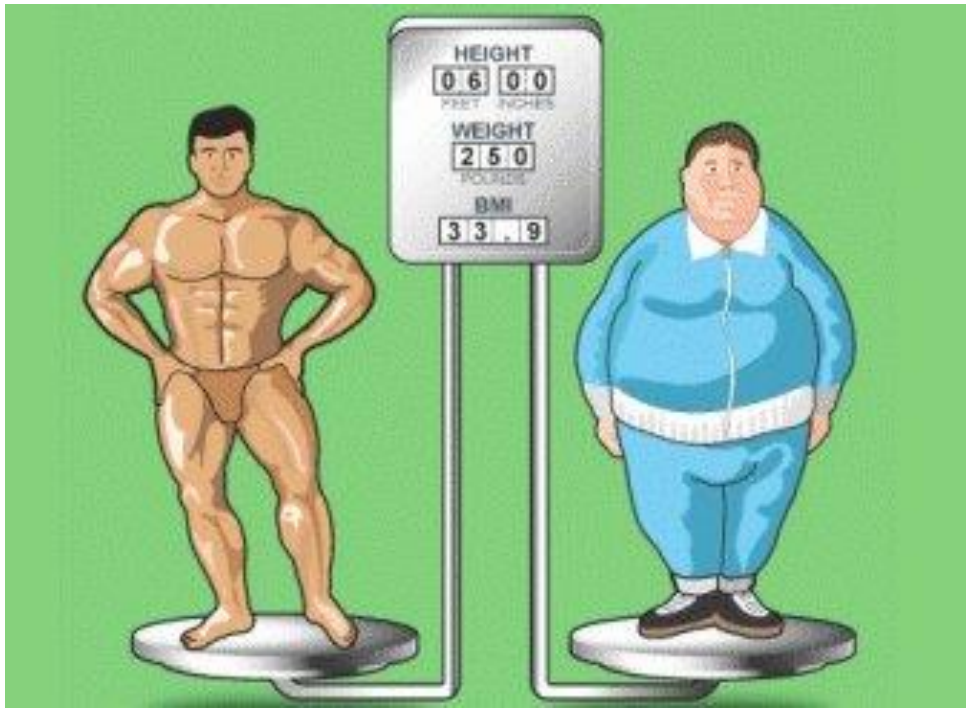
Table 3
Individual and cumulative contribution of the items of the screening tools MUST and PG-SGA SF to the explained variance in nutritional status

	R^2 per item	Cumulative* R^2	ROC-AUC (95% CI)
MUST			0.63 (0.54–0.72)
Weight loss	0.109	0.109	
No food intake ≥5 d	0.045	0.035	
BMI	0.013	0.002	
Total R^2		0.146	
PG-SGA-SF			0.87 (0.80–0.92)
Nutritional impact symptoms	0.571	0.571	
Food intake	0.289	0.071	
Daily functioning	0.274	0.034	
Weight	0.248	0.066	
Total R^2		0.742	

AUC, area under the curve; BMI, body mass index; MUST, Malnutrition Universal Screening Tool; PG-SGA-SF, Patient-Generated Subjective Global Assessment Short Form; ROC, receiver operating characteristic.
*Increase in explained variance after addition of an individual screenings item.

Discussion

- Sensitivity of MUST unacceptably low (similar to earlier studies)
  - due to relying on weight and BMI



In CKD, as muscle stores decrease there is a simultaneous increase in fat and fluid mass

Therefore, weight (alone) is not a good indicator of changes in nutritional status

Discussion

- Sensitivity of MUST unacceptably low (similar to earlier studies)
  - due to relying on weight and BMI – both poor indicators of malnutrition in CKD
- Patients completing PG-SGA-SF may overestimate nutrition impact symptoms, improved sensitivity if dietitians completed this form with patients in earlier studies
- Nutrition impact symptoms explained 57% of variance in nutritional status
- Previous study[3] shown nutrition impact symptoms alone had 89% sensitivity to detect malnutrition and sig assoc with admission LOS

[3] MacLaughlin HL, Twomey J, Saunt R et al. 2018. The nutrition impact symptom score detects malnutrition risk in patients admitted to nephrology ward. Journal of Human Nutrition and Dietetics, vol 31

Limitations

- Use of PG-SGA rather than SGA which is a more common nutritional assessment tool
- Incorporation bias of PG-SGA-SF domains into the PG-SGA

Strengths

- Clinical relevance and application
  - inpatient screening tools most often MST / MUST which fail to identify malnutrition in most CKD patients
  - simple tool, completed by either patients or clinicians

Conclusion

- PG-SGA-SF is an easy to use, with high overall accuracy (87%) to identify malnourished CKD patients
- Nutrition impact symptoms have the largest impact on identification of malnutrition in CKD patients

Application in RSC

- Malnutrition screening in CKD should incorporate exploration of symptoms that impact on dietary intake
- PG-SGA-SF may be a useful screening tool to assist in referral / prioritisation
- When not possible to conduct SGA (i.e. telehealth) PG-SGA-SF may be a useful tool to indicate nutritional risk