



Malnutrition: what is it and why does it matter?

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Learning Objectives

1. What is malnutrition?
2. Malnutrition and disease
3. Effects of malnutrition
4. Impact of health outcomes
5. Economic impact
6. Nutritional support - who benefits?

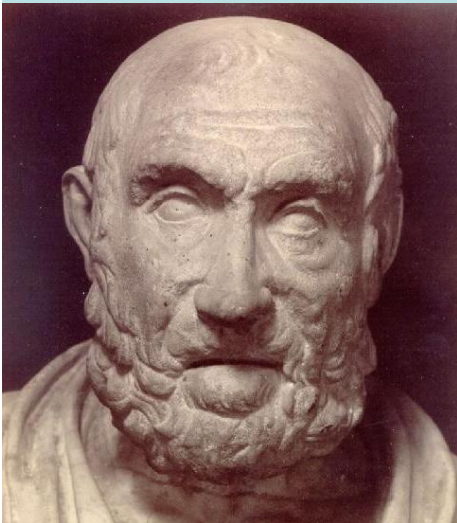


WHAT IS MALNUTRITION?



It all started out so well.....

- “In the face of illness, thin people do badly”
 - Hippocrates



- “thousands of patients are annually starved in the midst of plenty from want of attention to the ways which make it possible for them to take food. I say to the nurse, have a rule of thought about your patient's diet”



Florence Nightingale, 1859



Unfortunately, we lost the advantage....

“Clinical nutrition has become the ‘***cinderella of modern medicine***’....not least because of a failure of its practitioners to define it in a way that engages doctors and causes them to take it seriously”

*Professor Simon Allison,
Chairman of ESPEN 2002*



The problem with definitions..

“Malnutrition is a state of nutrition in which a deficiency (or excess) of energy, protein and micronutrients causes *measurable adverse effects* on tissue/body form (body shape, size and composition) *and function, and clinical outcome.*”

Marinos Elia



Defining malnutrition syndromes (according to aetiology)

- **Starvation-related malnutrition**
 - *Eg. Anorexia nervosa*
- **Acute Disease-related malnutrition**
 - *Eg. sepsis, burns, trauma or closed head injury.*
- **Chronic disease-related malnutrition**
 - *Eg rheumatoid arthritis, organ failure, pancreatic cancer, chronic diseases in older patients, sarcopenic obesity.*



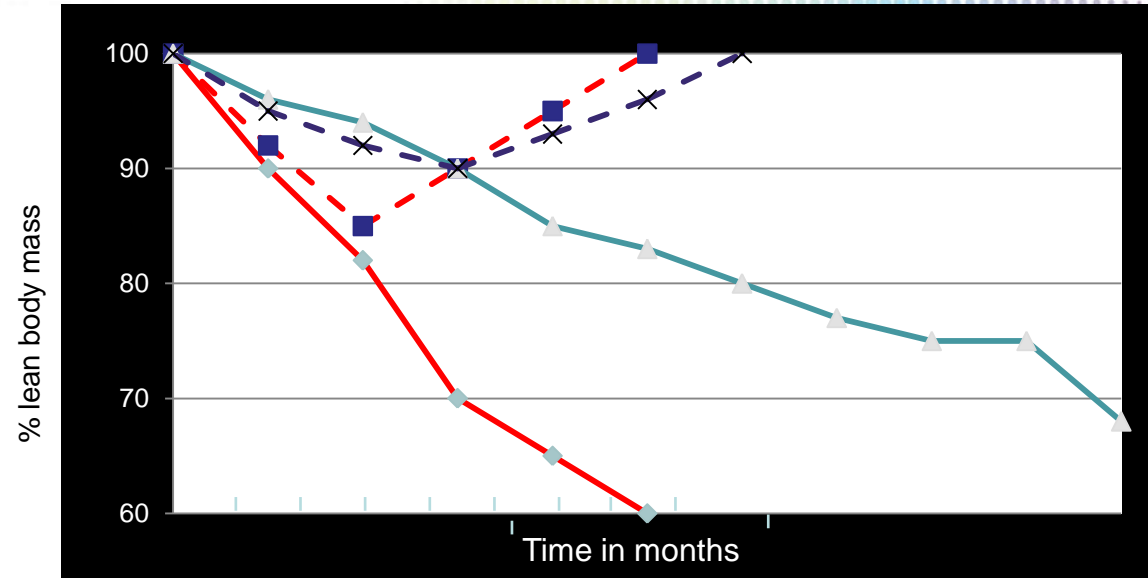
...and a few more malnutrition syndromes

- **Sarcopenia**
 - Loss of muscle mass and function
- **Sarcopenic obesity**
 - Above in presence of obesity ie “fat frail”
- **Cachexia**
 - Severe loss of weight, fat and muscle and increased protein catabolism due to underlying disease
- **Pre-cachexia**
 - Underlying chronic disease weight loss of <5%, chronic systemic inflammatory response and anorexia.

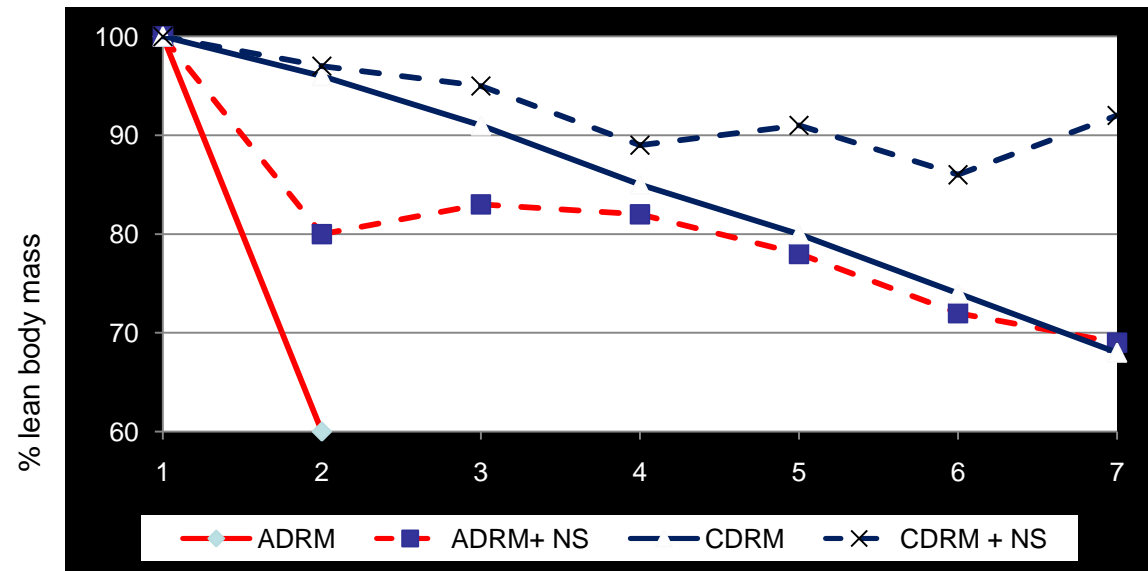


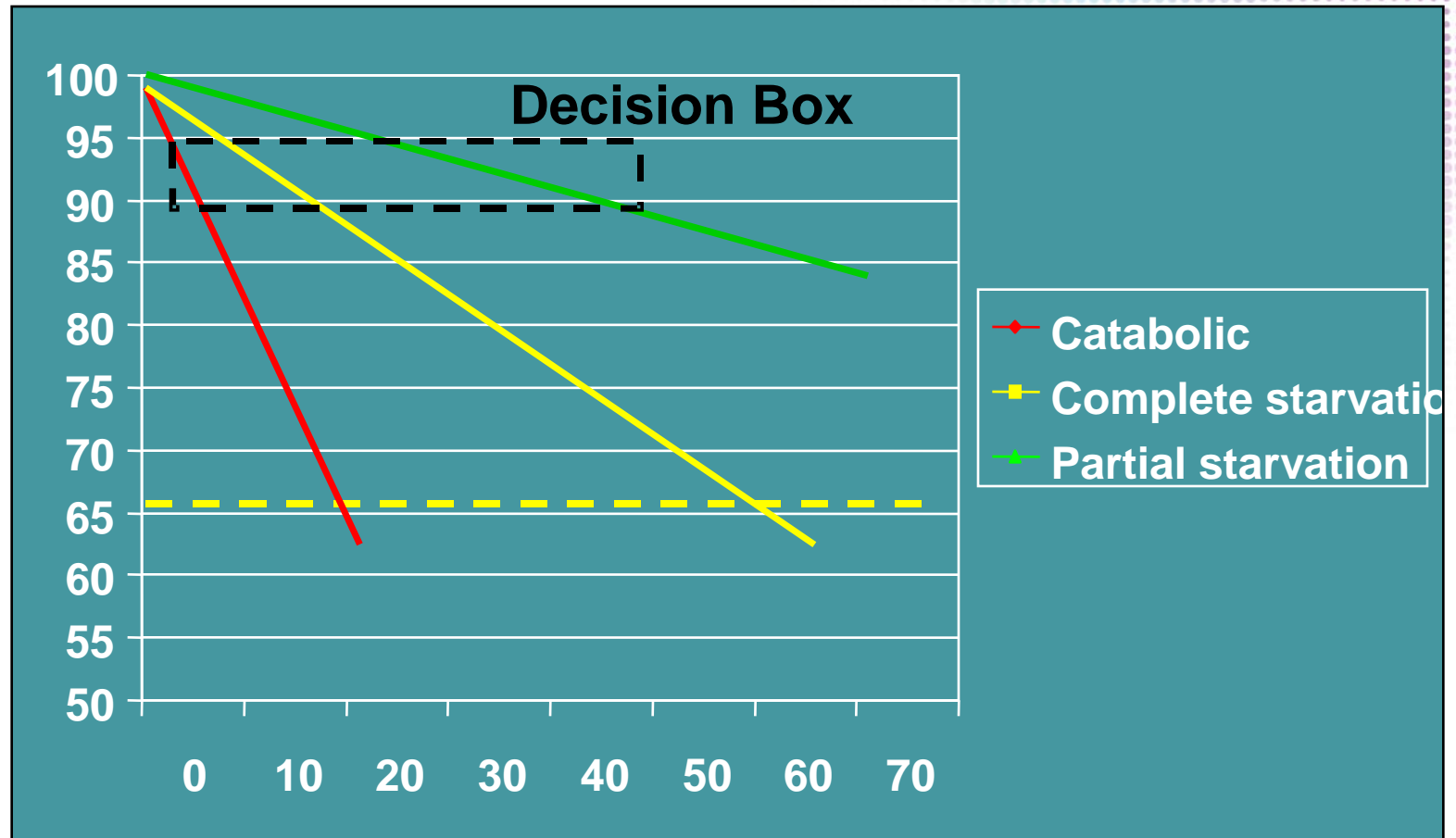
Why it helps to differentiate

**Starvation
related
malnutrition**



**Disease related
malnutrition**







NICE criteria (2006)

- ❑ a body mass index (BMI) of **<18.5 kg/m²**
- ❑ unintentional weight loss **>10%** within the last **3–6 months**
- ❑ a BMI of **<20 kg/m²** and unintentional weight loss **>5%** within the last **3–6 months**



Those at risk:

those who have:

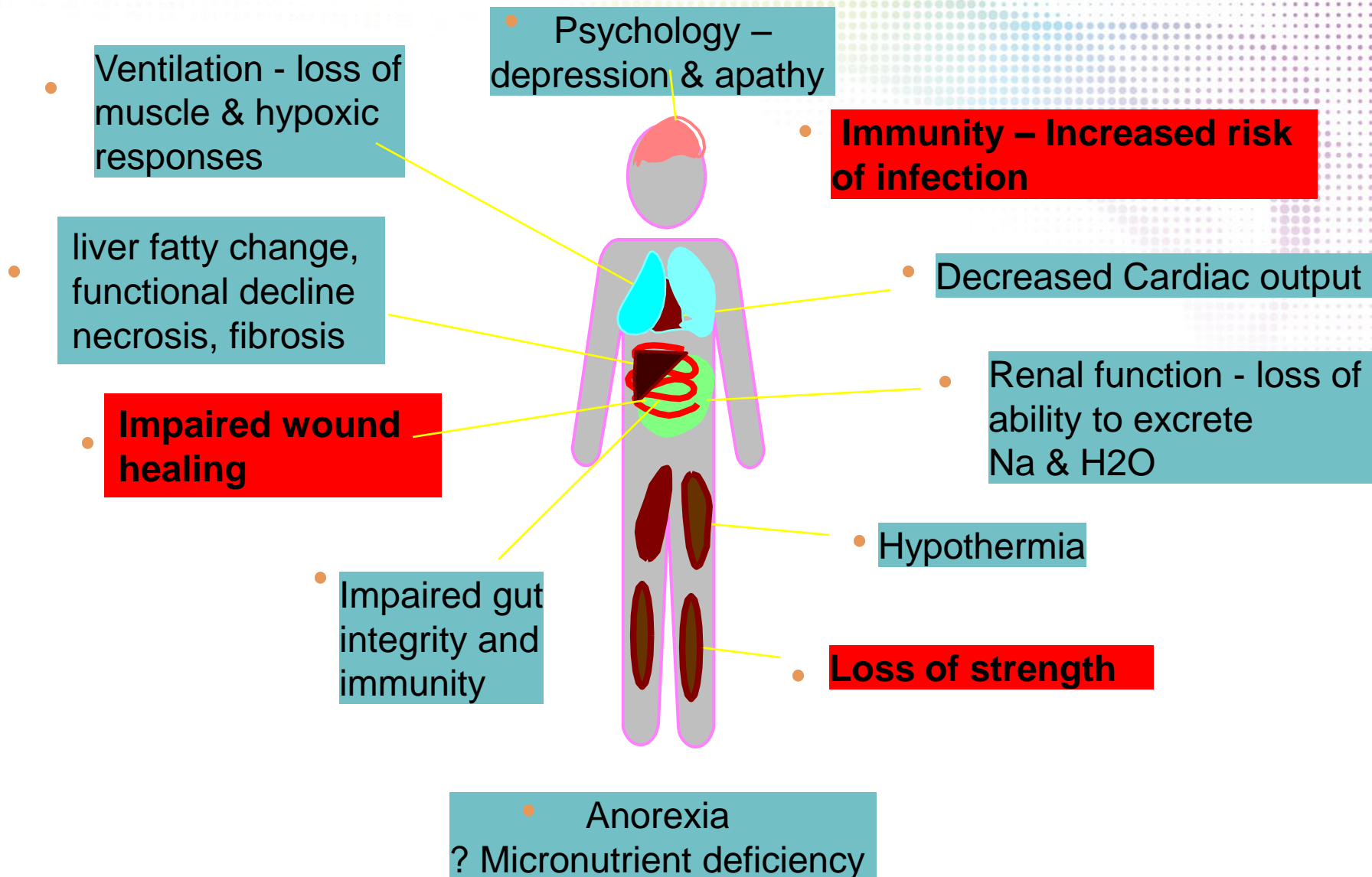
- eaten little or nothing for more than 5 days and/or are likely to eat little or nothing for 5 days or longer
- a poor absorptive capacity and / or high nutrient losses and/or increased nutritional needs from causes such as catabolism



EFFECTS AND CONSEQUENCES OF MALNUTRITION



Effects of Undernutrition





Starvation causes reductive adaptation/conservation.

REDUCED FOOD INTAKE

Reduced Mass

**Reduced work, increased
efficiency**

Changed body composition

Changed metabolism

**Metabolically stable BUT
loss of reserve and functional capacity
'Marasmus'**





REDUCED FOOD INTAKE

Reduced Mass

Reduced work, increased efficiency

Changed body composition

Changed body composition

Marasmus

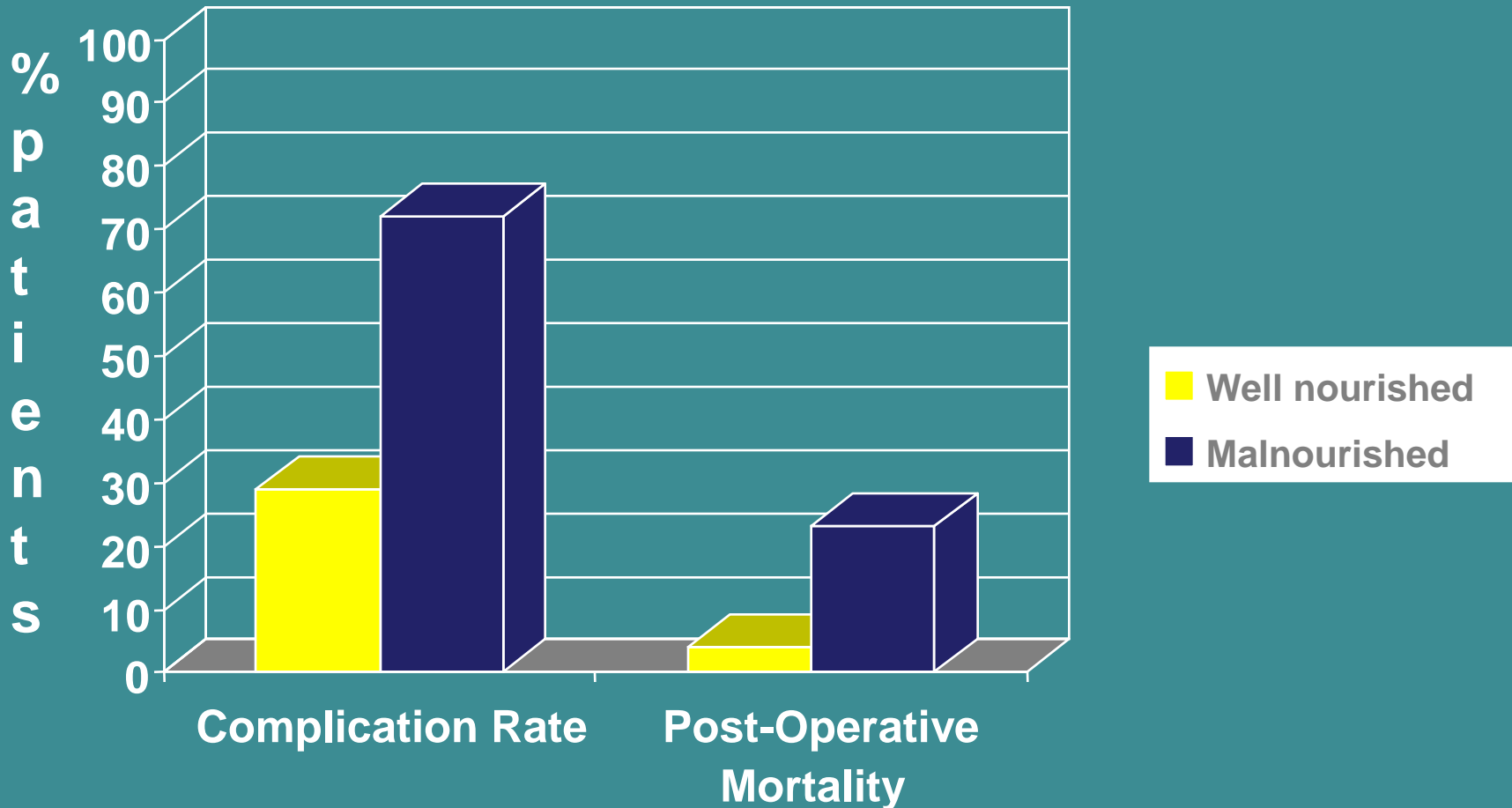
Infection, trauma, small bowel overgrowth, specific deficiency, abnormal losses, excessive intake, unbalanced intake

Loss of homeostasis



Complications after abdominal surgery for malignant disease

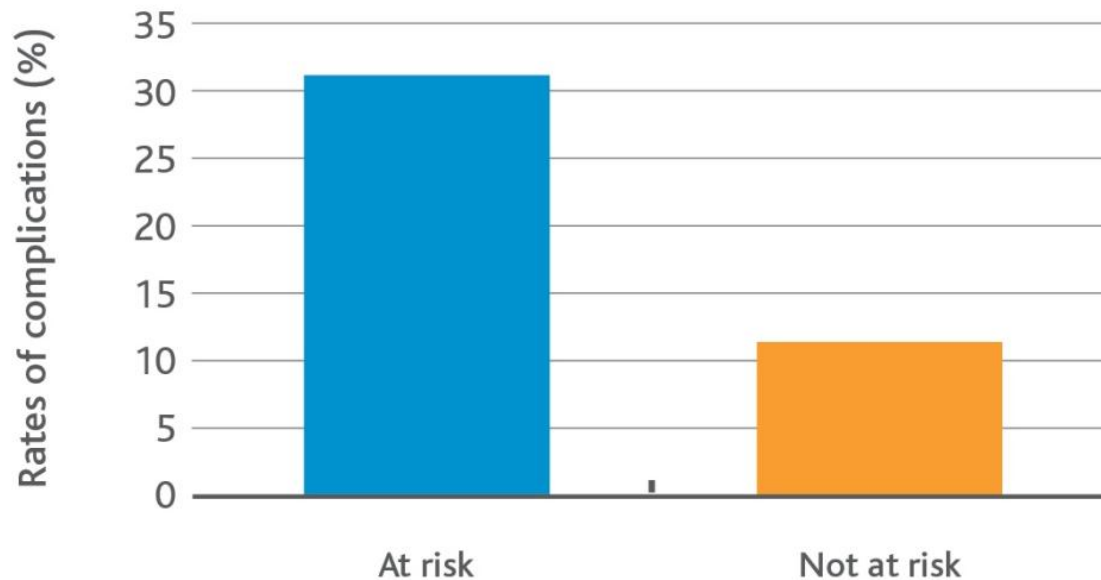
Meguid et al, Am J Surg. 156, 1988





Malnourished patients have 2 to 3 times more complications

Frequency of complications in at risk vs not at-risk patients



EuroOOPS Study: $n = 5051$, mean age 59.8 years (± 0.3 SEM), 12 countries, 26 hospital departments. $P < 0.001$.



...more frequent hospital admissions

Malnourished patients experience a significantly higher total re-admission rate than well-nourished patients¹

Nutritional Status	Re-admission rate
Malnutrition	30.7%
Normal nutrition	20.7%
Over nutrition	17.7%

$n = 400$, mean age 57.3years (± 17.5), $P < 0.05$

1. Planas M, Audivert S, Perez-Portabella C, Burgos R, Puiggros C, Casanelles JM et al. Nutritional status among adult patients admitted to an university-affiliated hospital in Spain at the time of genoma. Clin Nutr 2004; 23(5):1016-1024.



Use more healthcare resource..

No. of visits or hospital admissions per
subject (≥ 65 y) per year (Elia et al 2006)

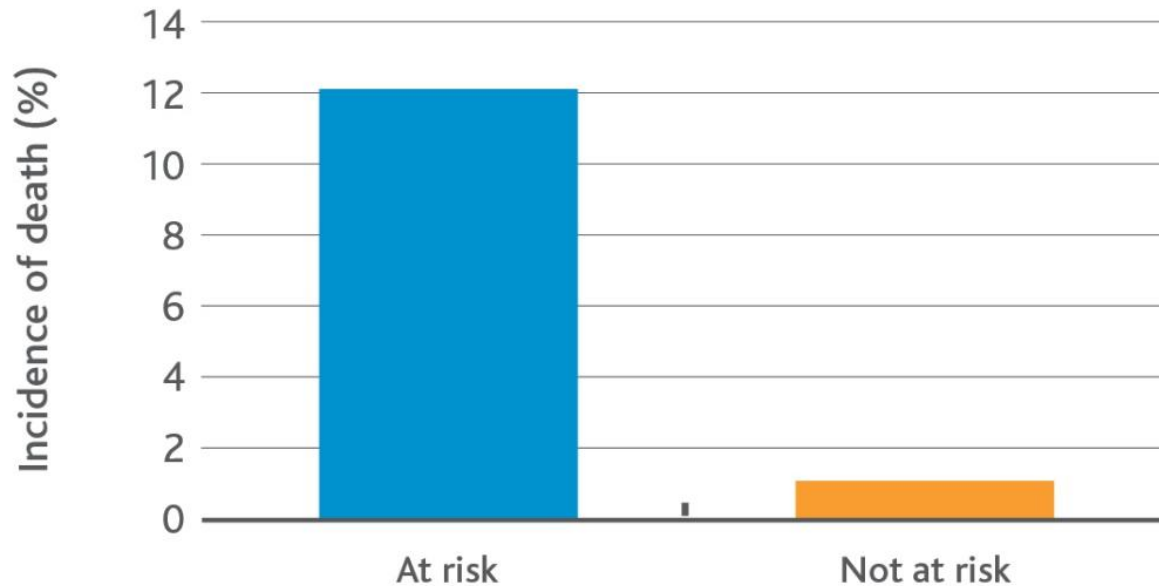
	No MN*	MN	% increase
GP visits	4.31	7.10	+65%
Hospital OP visits	1.02	1.36	+33%
Hospital admissions	0.28	0.50**	+80%

*Low risk according to 'MUST'

** Length of hospital stay increased by **> 30% - 70%** in malnourished and less likely to be discharged home.



..and are more likely to die



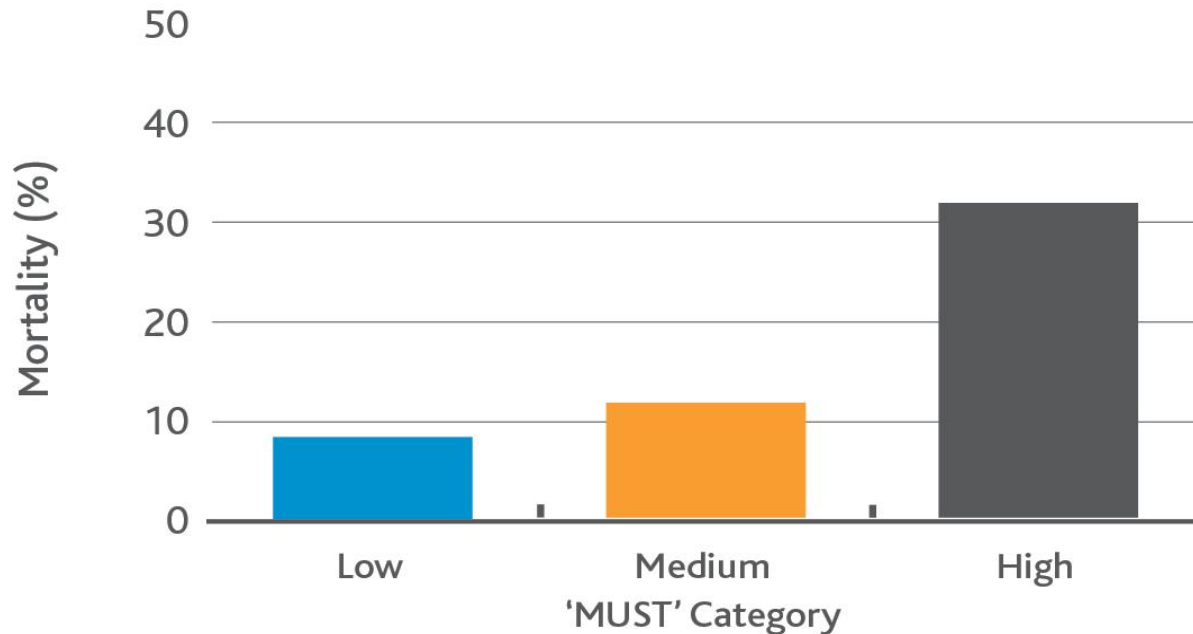
EuroOOPS Study: $n = 5051$, mean age 59.8 years (± 0.3 SEM), 12 countries, 26 hospital departments. Follow-up period of 28 days, $P < 0.001$.

1. Sorensen J, Kondrup J, Prokopowicz J, Schiesser M, Krahenbuhl L, Meier R et al. EuroOOPS: an international, multicentre study to implement nutritional risk screening and evaluate clinical outcome. Clin Nutr 2008; 27(3):340-349.



Malnutrition is associated with increased mortality in older hospital patients¹

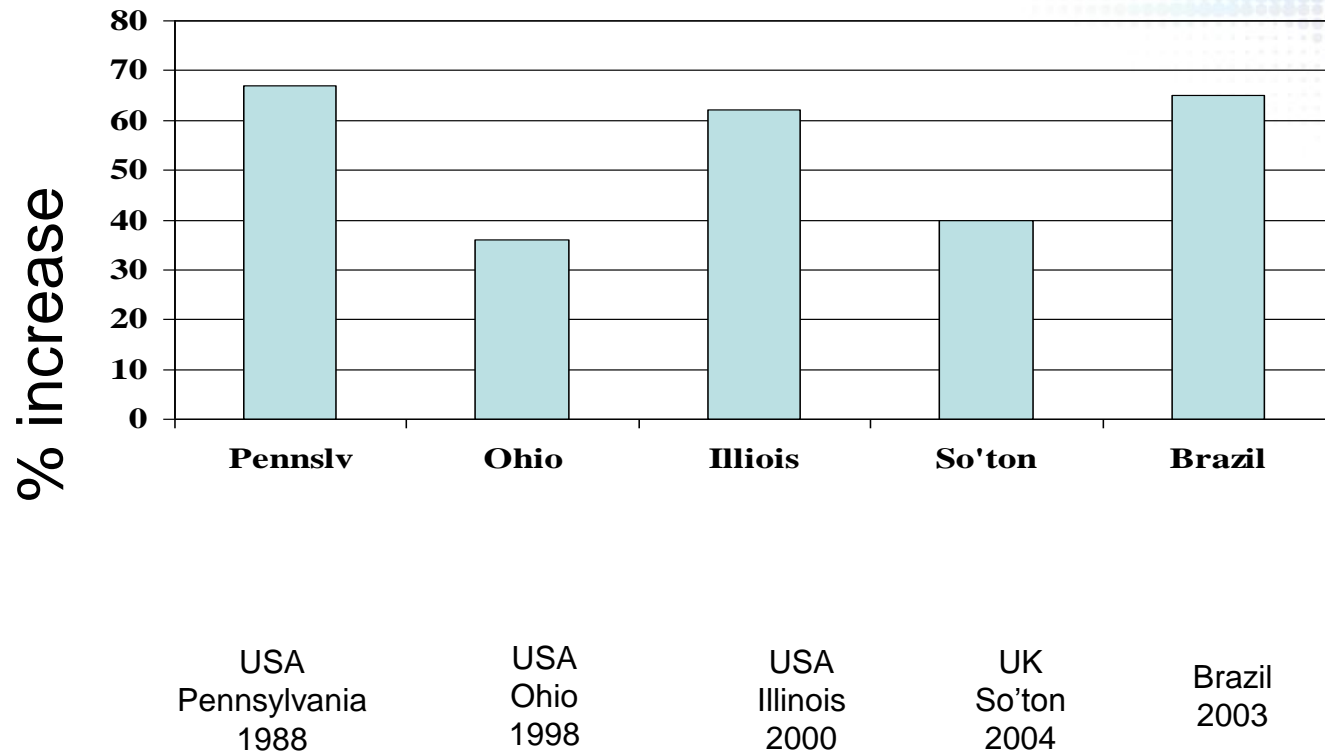
Mortality according to malnutrition risk category



Patients at risk of malnutrition ('MUST' categories medium and high) . $P = 0.01$.



Hospital costs for malnourished patients % increase above normally nourished

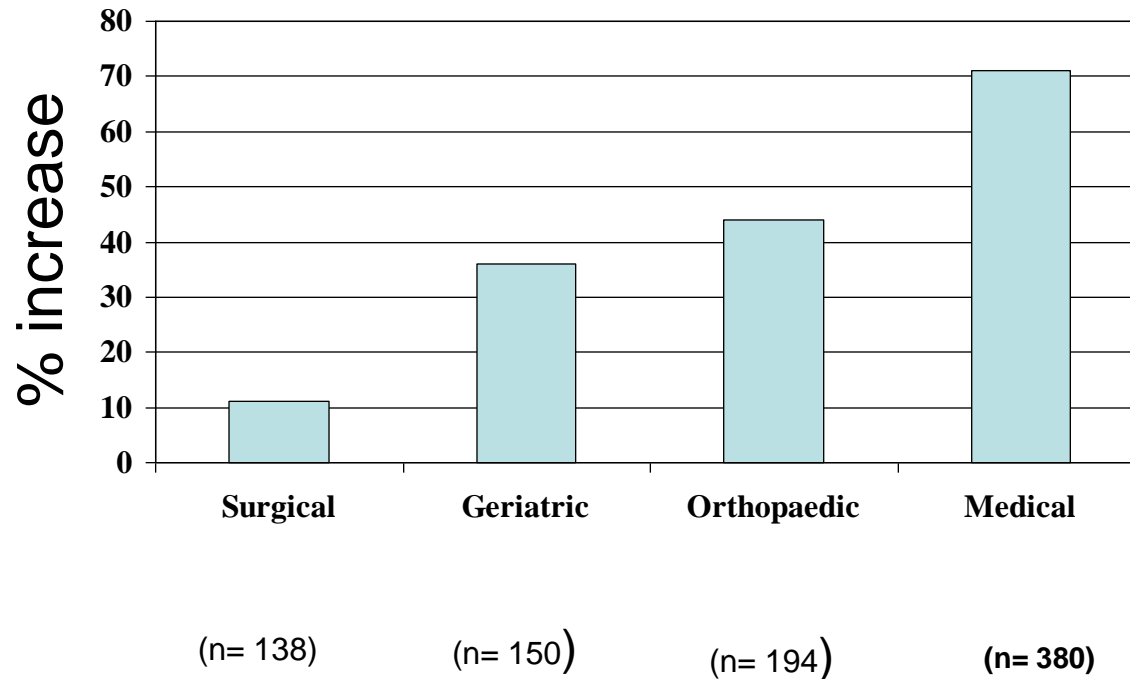


* A review in the USA (1996) suggested 35-75% increase in costs



Hospital costs for malnourished patients in UK

% increase above normally nourished





Costs of malnutrition (and associated disease)

- Affects 20 million in the EU at an estimated annual cost of €120billion

Conference held in EU Parliament, Tuesday 9 November 2010

- 3 million in the UK, at an estimated cost of £13billion stg

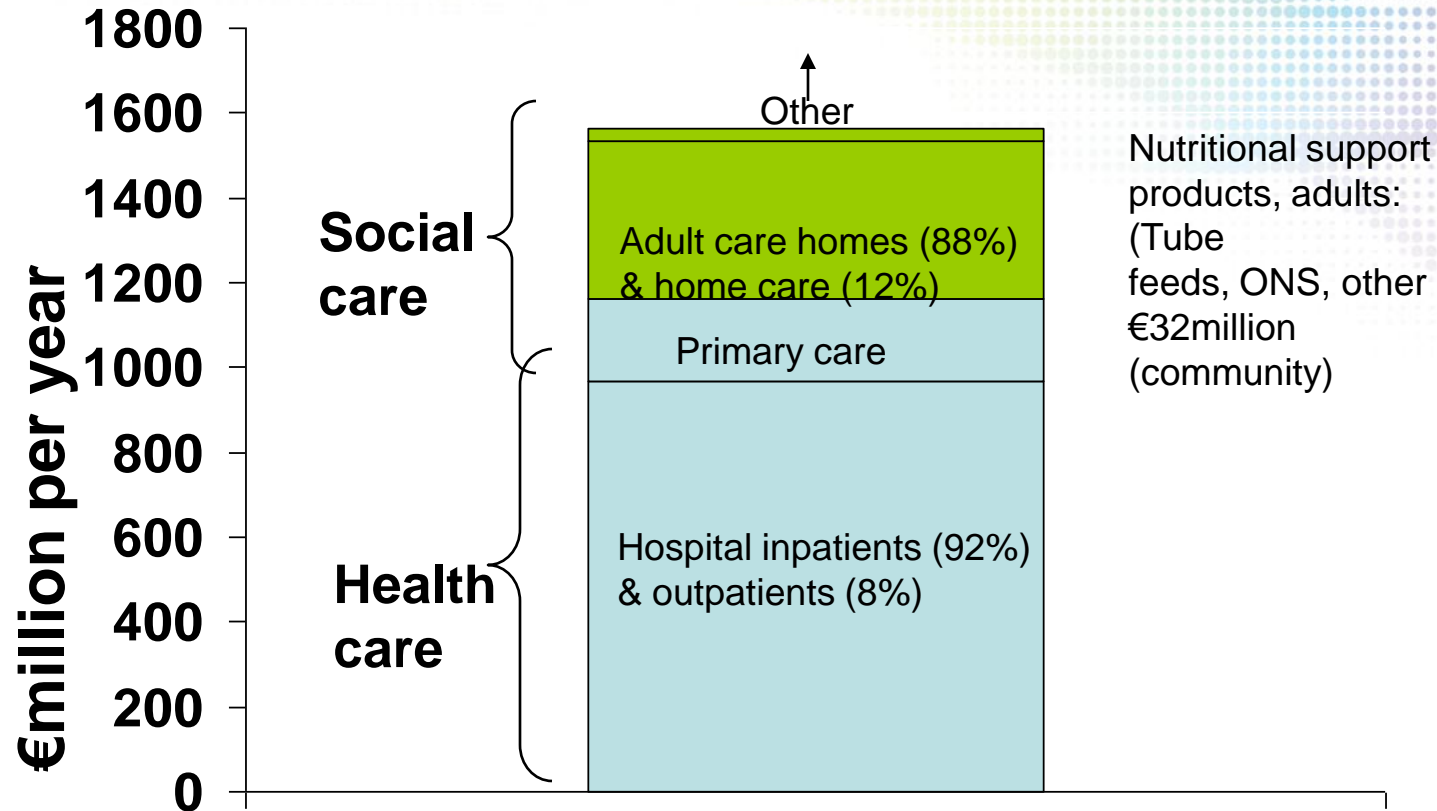
BAPEN 2009 Report

- 140,000 in ROI, at an estimated cost of €1.5billion

Rice, Normand. Journal of Public Health Nutrition 2012.

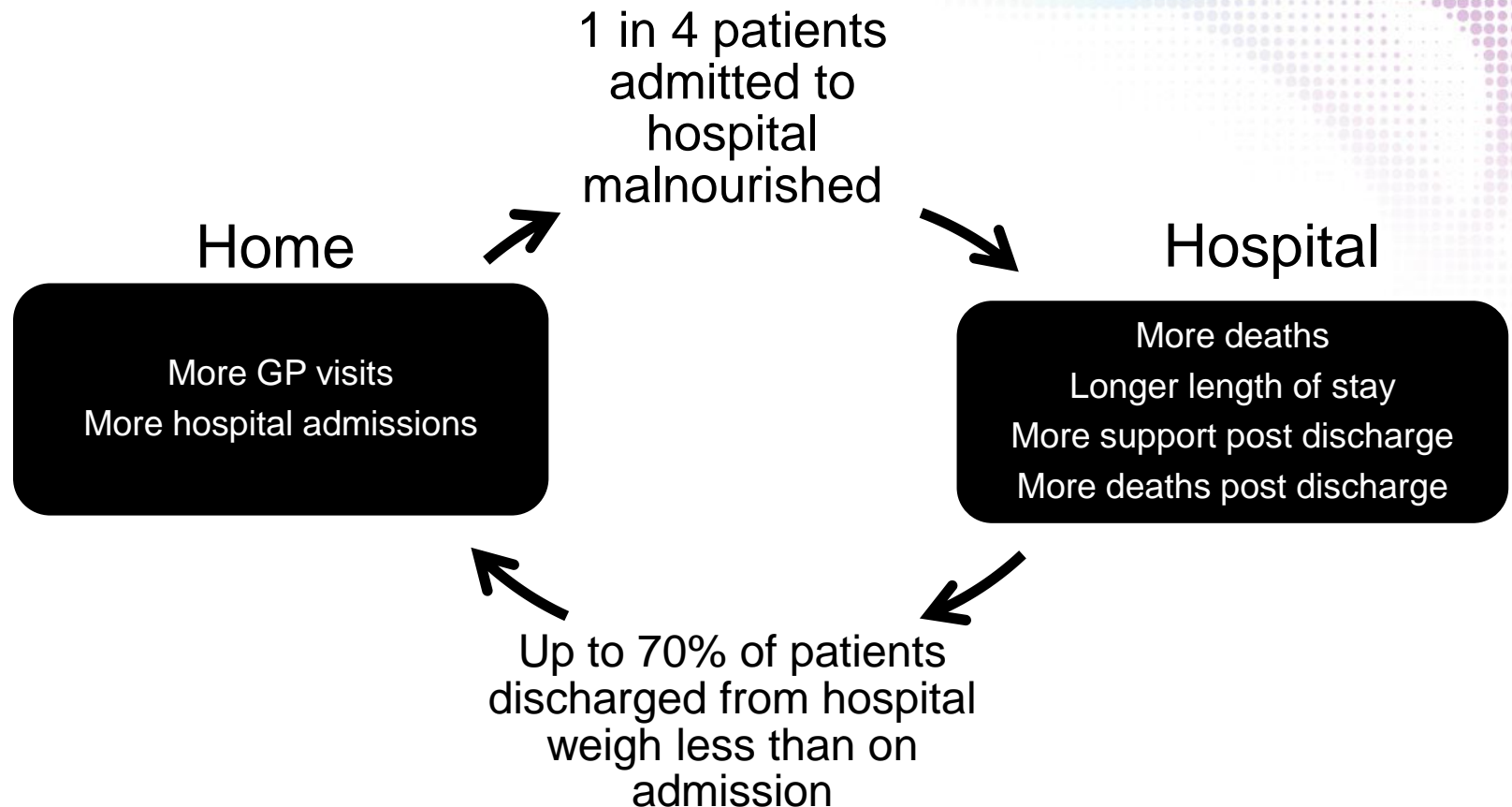


Estimated cost of DRM in Ireland in 2007



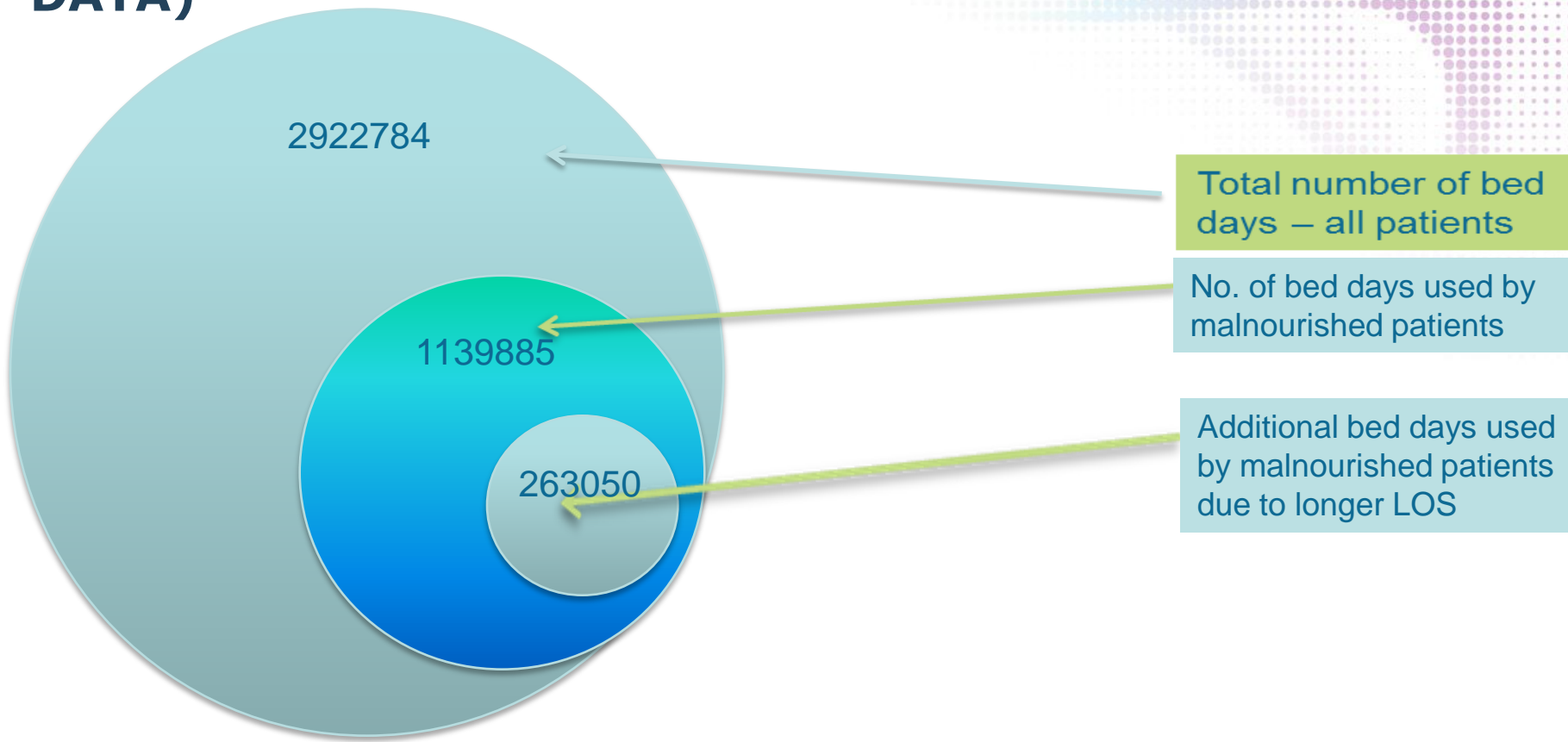


The malnutrition carousel





Inpatients with disease-related malnutrition (2007, USING HIPE DATA)



Ideally, nutritional support should::

- Improve general status
 - Immune function
 - Wound healing
 - Ventilation
 - Strength
 - Mobility
 - Psychology
- Improve outcome



Does it?



EVIDENCE BASE



The Problems in Nutritional research

- Trials use different
 - Indications for intervention AND EXCLUSION
 - Levels of feeding
 - Controls
 - Starting times
 - Routes of support
 - Duration of support
 - Outcome measures



The Evidence



Wanted – volunteers for
randomized, placebo controlled trial

Patients with an undoubted need for nutrition
support cannot be randomized



Evidence for oral nutrition supplements and tube Feeds – early studies

RCT of sip-feed supplements (approx 2) in 501 elderly care patients. Larsson et al. Clin Nutr 1990

- Supplemented group ate more hospital food
- Supplemented group mortality 8.6 % vs 18.6% in controls

RCT overnight NG feeding in underweight females with fractured NOF. Bastow et al. BMJ 1983

- ONS group mobilised at 16 days with 8% mortality vs controls at 23 days with 22% mortality
- (Normally nourished mobile at 10 days with 5% mortality.



Impact of nutritional supplementation on length of stay

- **Reduced length of hospital stay (LOS) found in patients who received ONS compared with control patients**
 - average reductions shown in a meta-analysis ranged from 2 days (in surgical patients) to 33 days (in orthopaedic patients)¹
- **Malnourished patients in a stroke **rehabilitation centre receiving ONS showed improved recovery****
 - higher level of functional independence was achieved and more of them were able to go home rather than to institutional care²

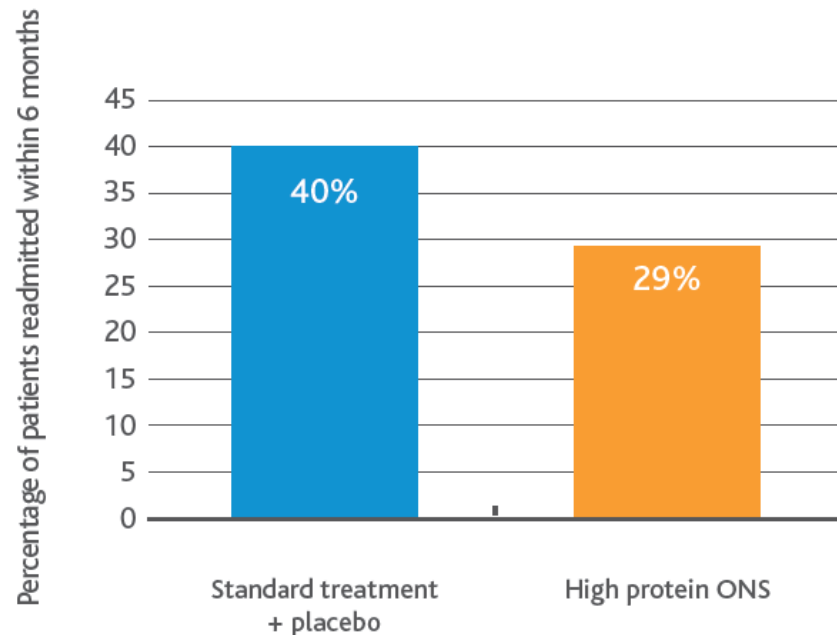
1. Stratton RJ, Green CJ, Elia M. Disease-related malnutrition: an evidence based approach to treatment. Wallingford: CABI Publishing; 2003.

2. Rabadi MH, Coar PL, Lukin M, et al. Intensive nutritional supplements can improve outcomes in stroke rehabilitation. *Neurology* 2008; 71(23):1856-1861.



Impact of nutritional intervention on readmission rates

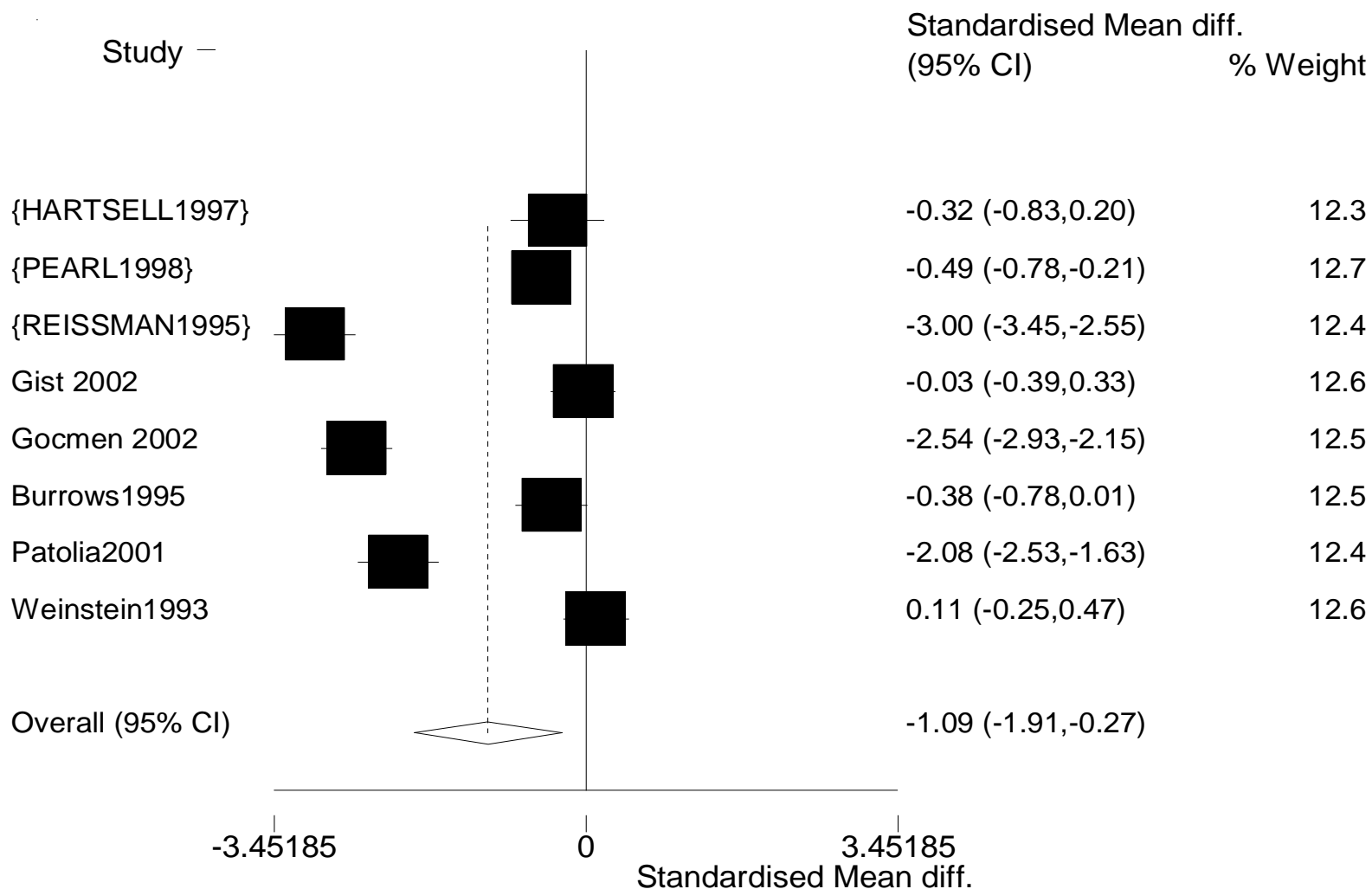
- Significantly **lower proportion of acutely ill older people readmitted** to hospital at six months when supplemented with high protein oral nutrition supplement (complete) compared with placebo¹



($p < 0.05$) (n = 445, aged between 65 and 92 years)



NICE data: Length of stay – impact of supplementation





How much would it be worth spending per patient to prevent / treat malnutrition?

€5,357^{*}

- Any spend BELOW this figure which successfully treats DRM might be anticipated to deliver savings.
- Spend above this average may add value by improving quality of healthcare but would require justification

**Estimated additional cost of MN (€750m) / number of people at medium/high risk of DRM (140,000)*



HOW TO IDENTIFY 'AT RISK' PATIENTS



Malnutrition is not easy to spot until advanced...





And getting harder to identify as the population widens...



A patient of average BMI at the start of an illness would have to lose 25% of his/her body weight before reaching the cut off point for 'low' BMI.



Under-recognised, under-detected, under-treated..



About 1 in 4
patients in
hospital ¹⁻⁷



More than 1 in 3
patients in care
homes ^{2;3;8-10}



< 1 in 10 older
persons living
independently¹¹

1. Russell C, Elia M. Nutrition Screening Survey in the UK in 2008: Hospitals, Care Homes and Mental Health Units. 2009. Redditch, BAPEN.
2. Meijers JM, Schols JM, van Bokhorst-de van der Schueren MA, et al. Malnutrition prevalence in The Netherlands: results of the annual Dutch national prevalence measurement of care problems. *Br J Nutr* 2009; 101(3):417-423.
3. Russell C, Elia M. Nutrition screening survey and audit of adults on admission to hospitals, care homes and mental health units. 2008. Redditch, BAPEN.
4. Russell C, Elia M. Nutrition Screening Week in the UK and Republic of Ireland in 2010. Hospitals, care homes and mental health units. 2011. Redditch, BAPEN.
5. Imoberdorf R, Meier R, Krebs P, et al. Prevalence of undernutrition on admission to Swiss hospitals. *Clin Nutr* 2010; 29(1):38-41.
6. Kruizenga HM, Wierdsma NJ, van Bokhorst MA, et al. Screening of nutritional status in The Netherlands. *Clin Nutr* 2003; 22(2):147-152.
7. Schindler K, Pernicka E, Laviano A, et al. How nutritional risk is assessed and managed in European hospitals: a survey of 21,007 patients findings from the 2007-2008 cross-sectional nutritionDay survey. *Clin Nutr* 2010; 29(5):552-559.
8. Suominen MH, Sandelin E, Soini H, Pitkala KH. How well do nurses recognize malnutrition in elderly patients? *Eur J Clin Nutr* 2009; 63(2):292-296.
9. Lelovics Z, Bozo RK, Lampék K, Figler M. Results of nutritional screening in institutionalized elderly in Hungary. *Arch Gerontol Geriatr* 2009; 49(1):190-196.
10. Parsons EL, Stratton RJ, Elia M. An audit of the use of oral nutritional supplements in care homes in Hampshire. *Proc Nutr Soc* 2010; 69:E197.
11. Kaiser MJ, Bauer JM, Ramsch C, et al. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. *J Am Geriatr Soc* 2010; 58(9):1734-1738.



BMI categories for chronic protein energy status

Roy Coll Phys Lond, MAG(BAPEN)

BMI (kg/m²) Weight category

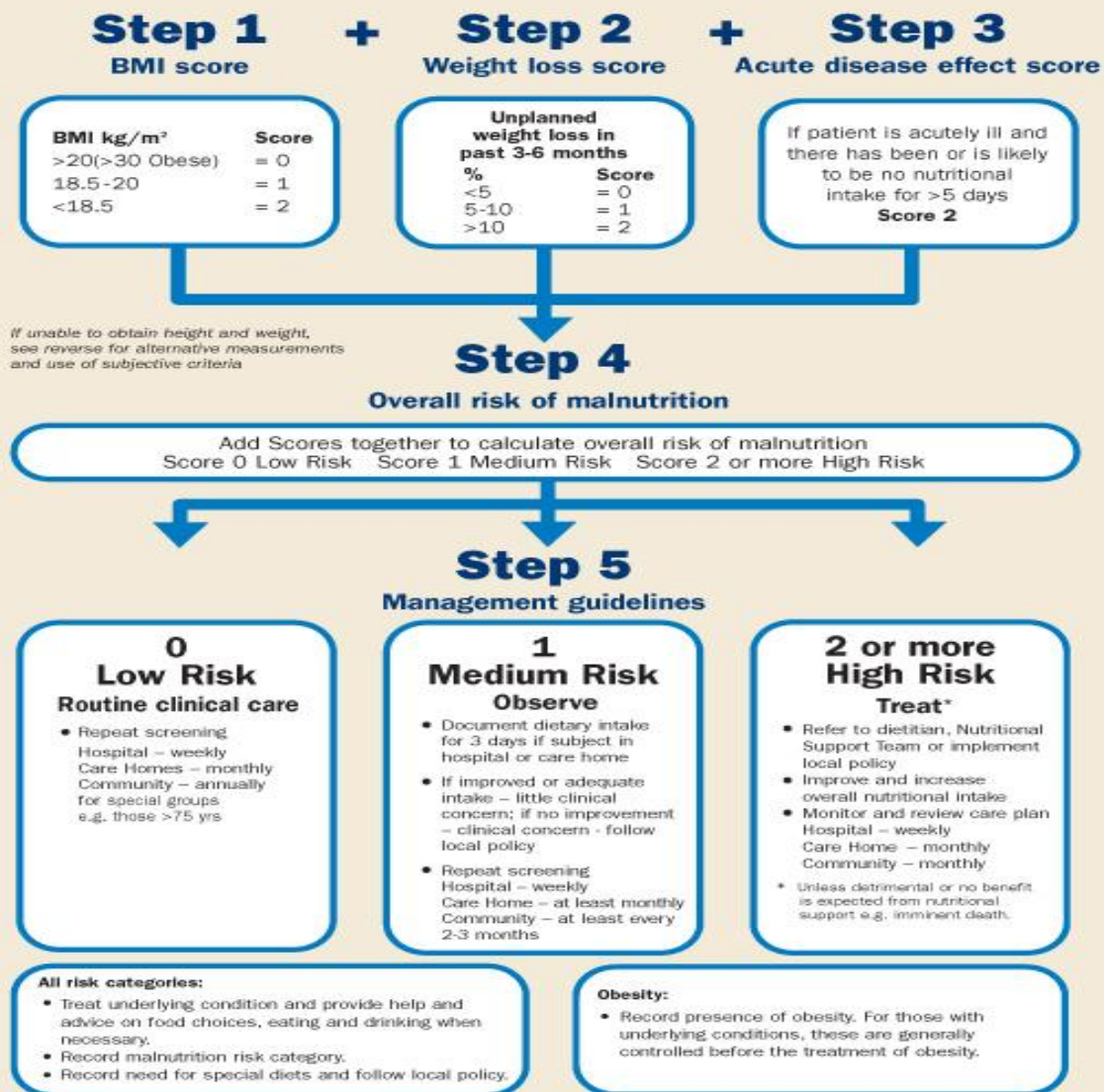
<18.5	Underweight (probable PEM*)
18.5-20	Underweight (possible PEM*)
20-25	Desirable weight
25-30	Overweight
>30	Obese

*** PEM = Protein-Energy Malnutrition**



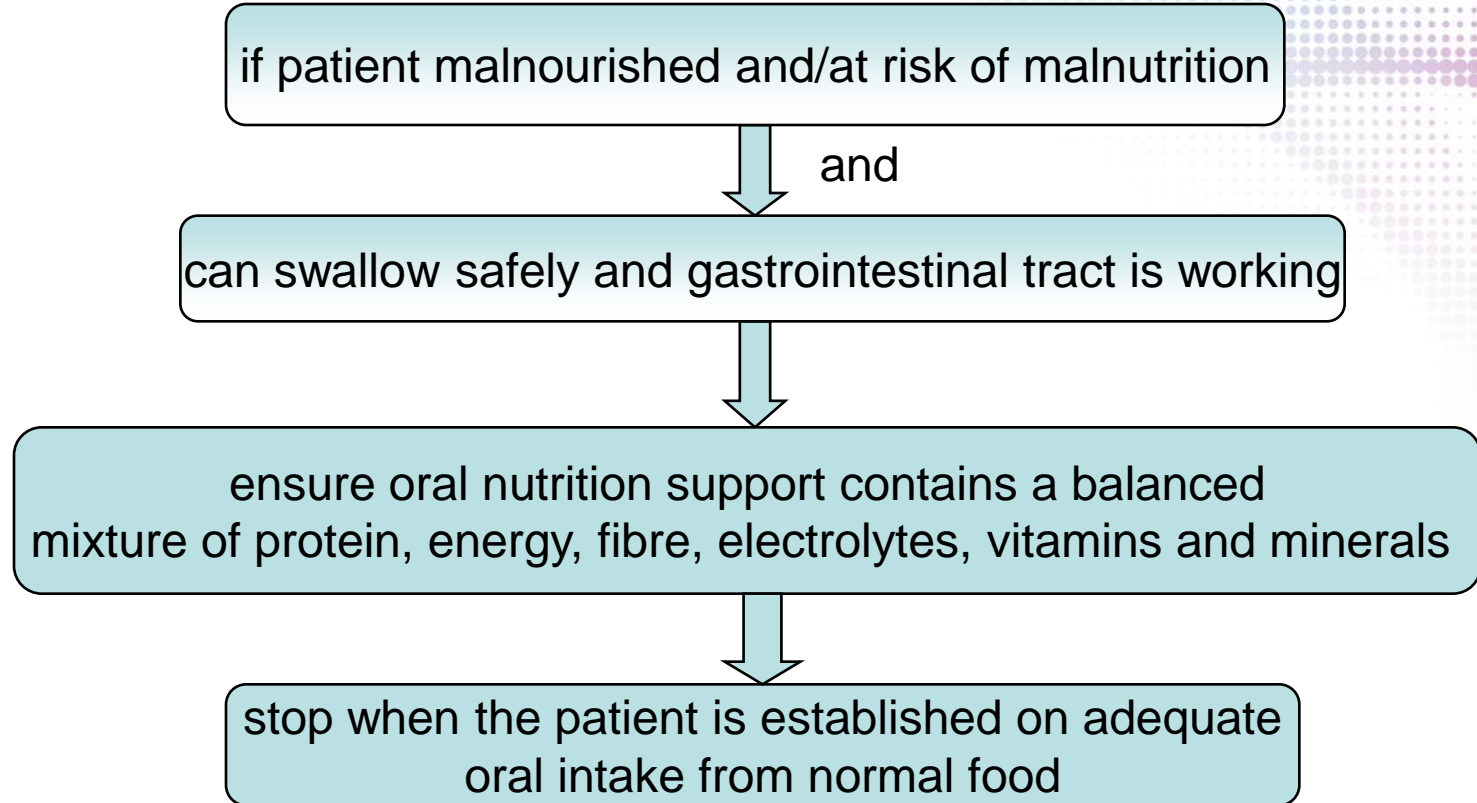
Unintentional weight loss over 3-6 months

- **<5% body weight:** normal intra-individual variation
- **5-10% body weight:** of concern
 - decrease in voluntary physical activity
 - increase in fatigue
 - less energetic
- **>10% body weight:** of significance
 - changes in muscle function
 - disturbances in thermoregulation
 - poor response or outcome to surgery and chemotherapy





Consider oral nutrition support





Does (mal) nutrition matter?

- Patients who are ill are likely to become malnourished
- The best time to act is early
- Nutritional support gives time for surgical and medical therapies to work