OALEED NOORDALLY, M.D.

LA DENUTRITION EN MILIEU HOSPITALIER

UNITE 1020, CHU BRUGMANN, site HORTA,
BRUXELLES, 22/10/2009.

PREVALANCE

Population	Prevalence	References
(n)	(%)	
CHG	23	Willard, 1980
CHG	48	Waitzberg, 2001
CHU	11	Corish, 2000
CHU	40	Mc Whirter, 1994
Medecine	45	Bistrian, 1976
Medecine	32	Chima, 1997
Chirurgie	54	Bistrian, 1974
Chirurgie	30-40	Perrot, 1982
Geriatrie	61	Bienia, 1982
Geriatrie	41	Constans, 1992

Malnutrition is undetected and untreated

Malnutrition unrecognised in	Prevalence (%)	References
Hospital Inpatients	70	Kelly, 2000
-do-	62	Mowe, 1991
Hospital Outpatients	45-100	Miller, 1990
Nursing Homes	100	Abbasi, 1990
Community	15-50	Wright, 1998, Bachelor,1990

La denutrition s'aggrave au cours de l'hospitalisation

Population	Aggravation de la denutrition	References
(n)	(%)	
Medecine (64)	69	Weinsier, 1979
CHU (569)	43	Corish, 2000
CHU (112)	75	Mc Whirter, 1994
Geriatrie (286)	63	Antonelli Incalzi, 1996
Medecine (622)	100	Pinchcofsky, 1985

Denutrition et Pathologies

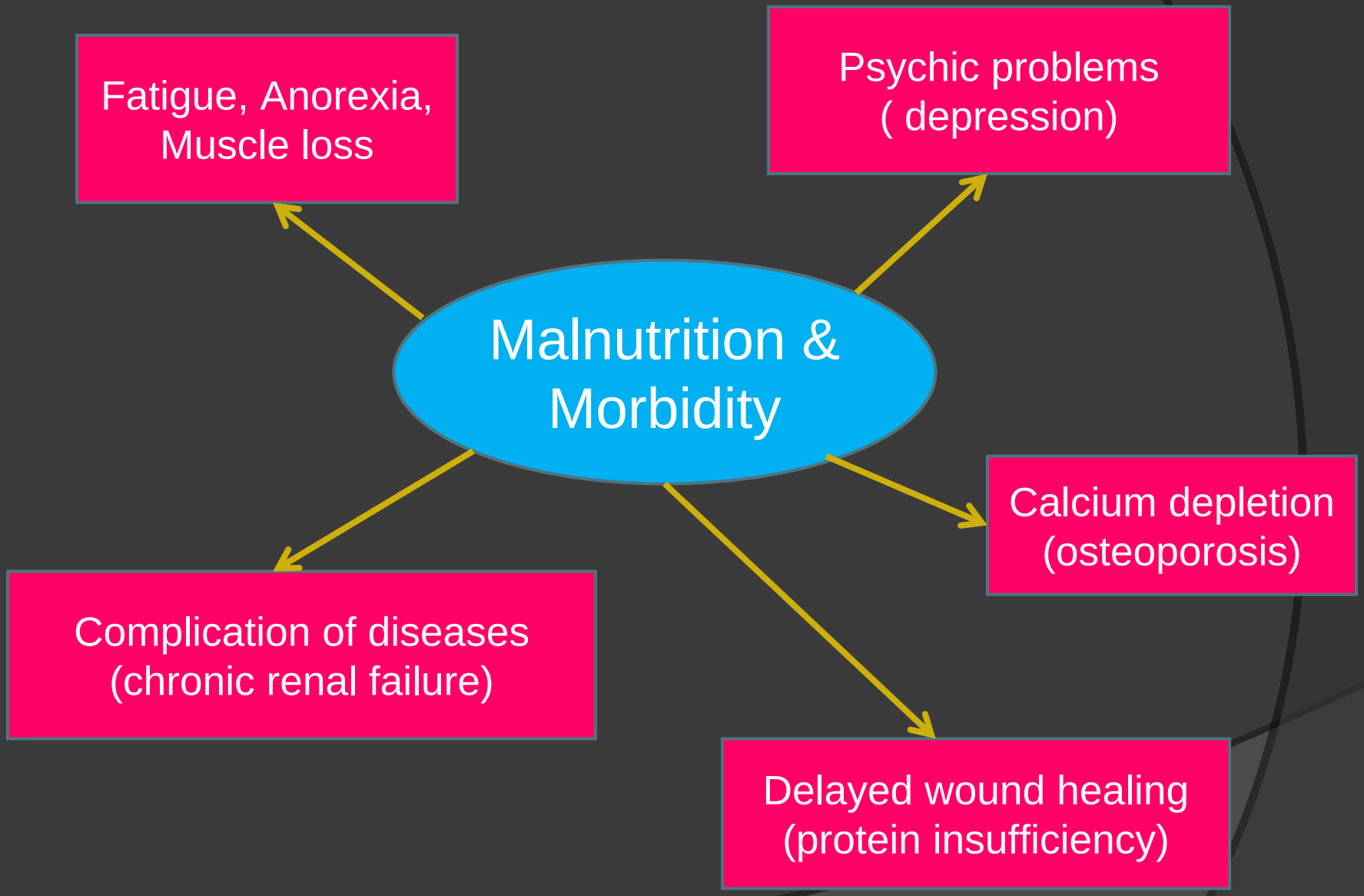
Pathologies	Prevalence (%)	No de patients en France
Les Cancers		700 000
Cancers digestifs hauts	70-80	
Cancers poumons	40	
Cancer sein	36	
SIDA	5-10 (lors du diagnostic)	130 000
Insuffisance Renale	25	150 000
avant dialyse	40	31 000
chez les dialyses	70	20 000
Insuffisance Respiratoire	20-60	1 500 000
AVC (avec trouble de la deglutition)	100	130 000
Periode post-operatoire	8.6	
Sujet age (>60 ans)	10-30	
Hepatopathie chronique	30	600 000 VHC

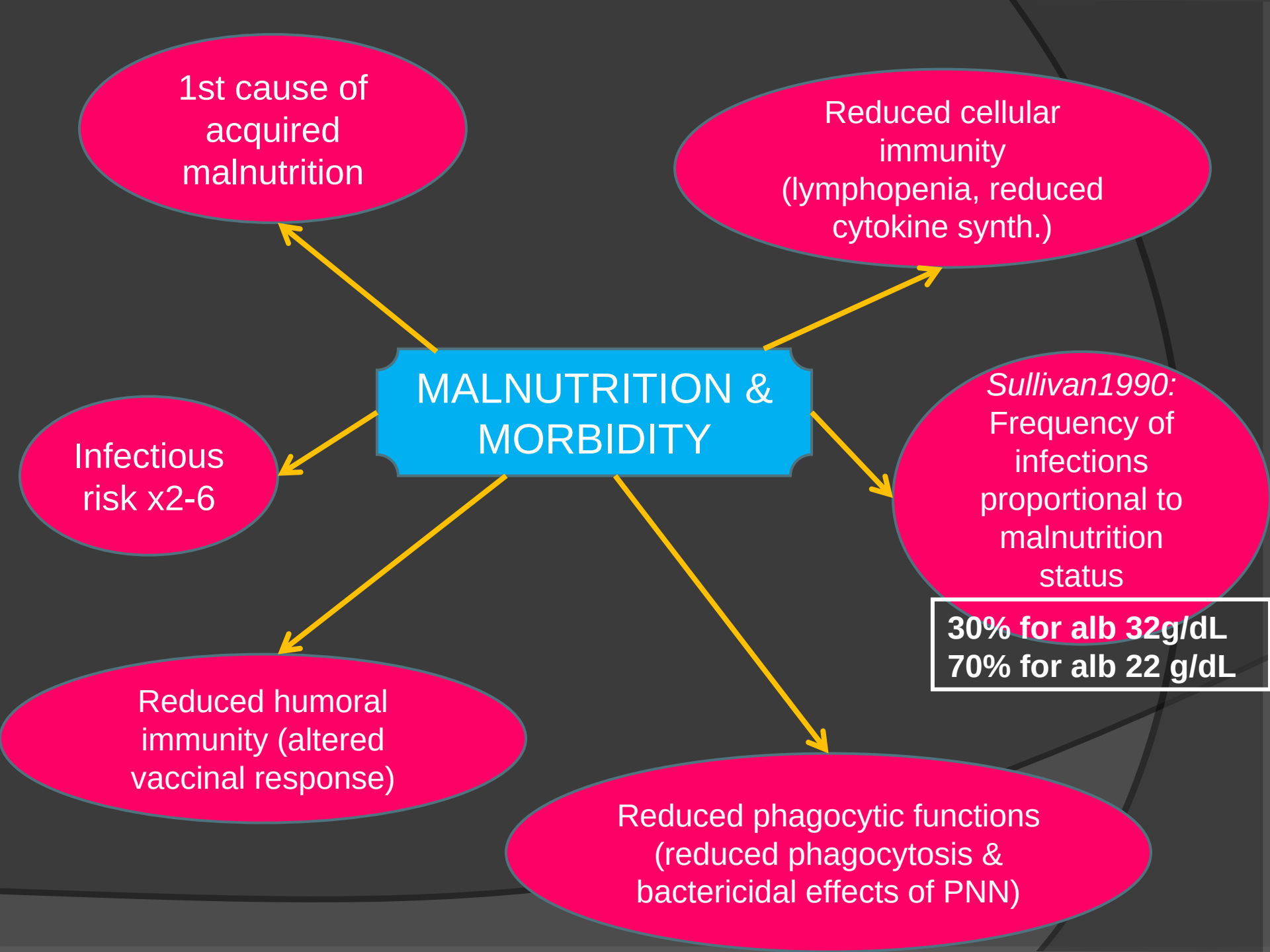
Population	Denutrition & Risques	Auteurs
Chirurgie Cardiaque		Engelmann, 1999
> Pontage coronaire	Morbidite,	
> Chirurgie valvulaire	DMS, mortalite	
Chirurgie Colo-rectale (avec anastomose basse)	Risque de fistule	Makela, 2003
Chirurgie Digestive & Thoracique majeure programmee (709 patients)	Complications septiques, complications & mortalite	Dos Santos Junqueira, 2003; Correia, 2003
> Severement denutris: 79%		
> Moderement denutris: 20.3%		
Cure de hernie inguinale	Infection du site operatoire	Dunne, 2003
Chirurgie oesophage, estomac, pancreas, colon	Complications, DMS en rea et DMS totale	Kudsk, 2003

		Odds Ratio
Facteurs de risque de *complications*	Denutrition	1.60
	Age > 60 ans	1.71
	Presence d'une infection	1.71
Facteurs protecteurs sur la *duree de sejour*	Absence d'infection	0.51
	Absence de cancer	0.80
	Etat nutritionnel normal	0.70
Facteur de risque de *mortalite*	Denutrition	1.87
	Age > 60 ans	2.30
	Presence d'un cancer	2.07

DMS chez les denutris: 16.7 +/- 24.5j v/s 10.1 +/- 11.7j
Couts hospitaliers chez les denutris: +308.9%

Correia, Nutrition 2003


Fatigue, Anorexia, Muscle loss
Psychic problems (depression)
Malnutrition & Morbidity
Calcium depletion (osteoporosis)
Complication of diseases (chronic renal failure)
Delayed wound healing (protein insufficiency)


1st cause of acquired malnutrition
Reduced cellular immunity (lymphopenia, reduced cytokine synth.)
MALNUTRITION & MORBIDITY
Infectious risk x2-6
Sullivan1990: Frequency of infections proportional to malnutrition status
30% for alb 32g/dL
70% for alb 22 g/dL
Reduced humoral immunity (altered vaccinal response)
Reduced phagocytic functions (reduced phagocytosis & bactericidal effects of PNN)

Relationship between nutritional status & length of stay and no. of new infective episodes

Nutritional status	Length of stay[1]	Number of new prescriptions[2]	Number of new infective episodes[3]
	Mean (SD) number (*n*)	Mean (SD) number (*n*)	Mean (SD) number (n)
Malnourished	8.86 (9.67) *n* = 167	5.28 (4.47) *n* = 166	0.38 (0.62) *n* = 167
Not malnourished	5.72(7.71) *n* = 675	4.49 (4.02) *n* = 672	0.23 (0.48) *n* = 674
Total	6.34 (8.22) *n* = 842	4.65 (4.12) *n* = 838	0.26 (0.52) *n* = 841

[1] $P < 0.001$ when applying Mann–Whitney *U*-test.
[2] $P = 0.024$ when applying Mann–Whitney *U*-test.
[3] $P = 0.001$ when applying Mantel–Haenszel test

Edington et al., Clin Nutr 2000

ORIGNAL ARTICLE

Clinical Nutrition, 2004

Prevalence of patients at nutritional risk in Danish hospitals

Henrik Højgaard Rasmussen[a,*], Jens Kondrup[b], Michael Staun[c], Karin Ladefoged[d], Hanne Kristensen[a], Anne Wengler[c]

RELATIONSHIP BETWEEN LOS & WEIGHT LOSS IN 116 PATIENTS

Hospitalization period (days)	Weight loss (kg, mean ± SD)	
0–6	3.0 ± 3.1	5%
7–13	4.0 ± 2.9	
14–20	4.0 ± 4.0	10%
21–27	5.9 ± 4.1	
28–41	8.6 ± 7.8	
41–55	4.9 ± 2.1	15%
>56	9.8 ± 7.6	

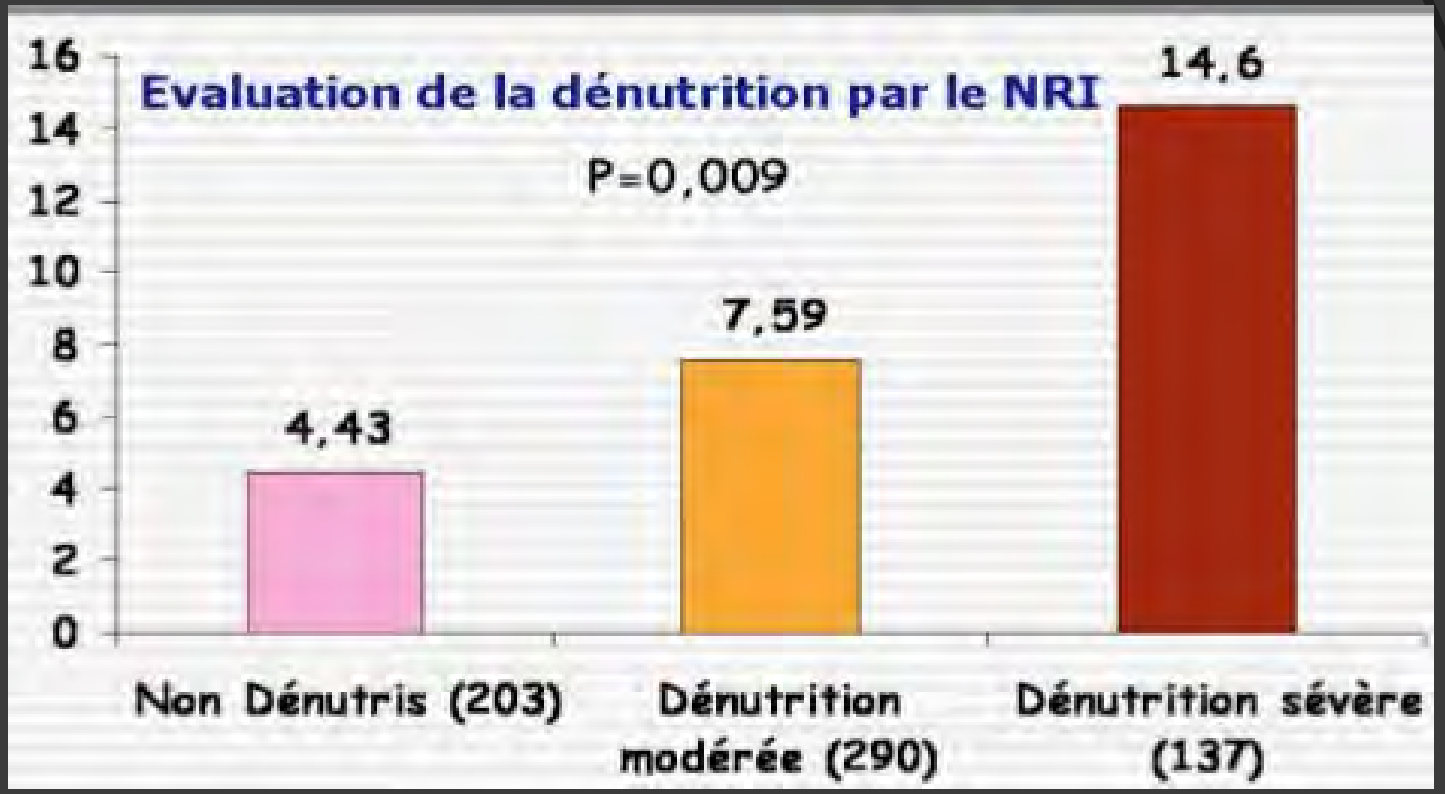
British Journal of Nutrition (2004), **92**, 105–111
DOI: 10.1079/BJN20041152

Malnutrition is an independent factor associated with nosocomial infections

Stéphane M. Schneider[1]*, Patricia Veyres[2], Xavier Pivot[3], Anne-Marie Soummer[4], Patrick Jambou[2], Jérôme Filippi[1], Emmanuel van Obberghen[4] and Xavier Hébuterne[1]

Relationship between malnutrition & nosocomial infection

Pourcentage de malades avec une infection nosocomiale (%)



Denutrition severe : OR= 4.98 (4.6-6.4)

La denutrition mesuree par le NRI est un facteur de risque independent d'infection nosocomiale chez un malade hospitalise

Schneider & Hebuterne, Br J Nutr, 2004

NOSOCOMIAL SITE INFECTION RISK AND MALNUTRITION

n = 1637

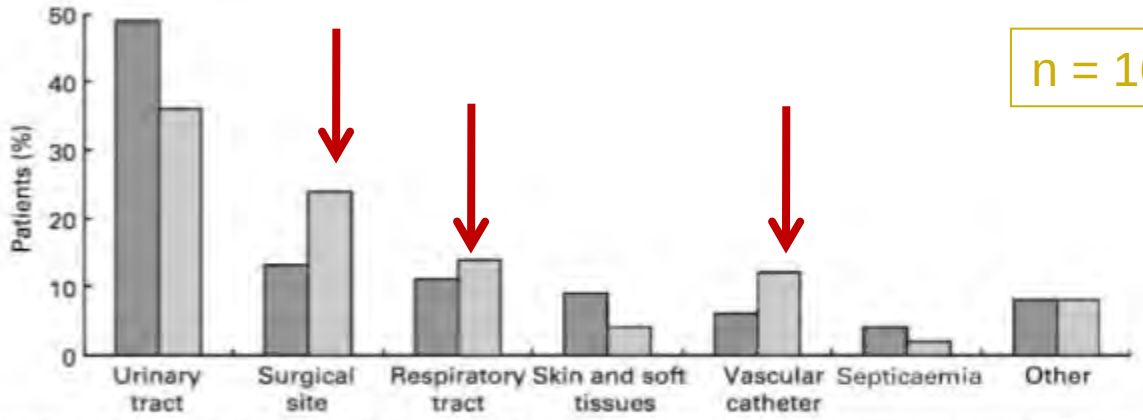


Fig. 1. Main nosocomial infection sites in all patients (*n* 1637) and in patients in whom the nutritional risk index (NRI) was calculated (*n* 630). ■, All patients; ■, NRI population. For details of patients and procedures, see Table 1 and p. 106. Mean values were significantly different from those of all patients: **P*=0·50.

BACTERIAL ETIOLOGY AT NOSOCOMIAL INFECTION SITES

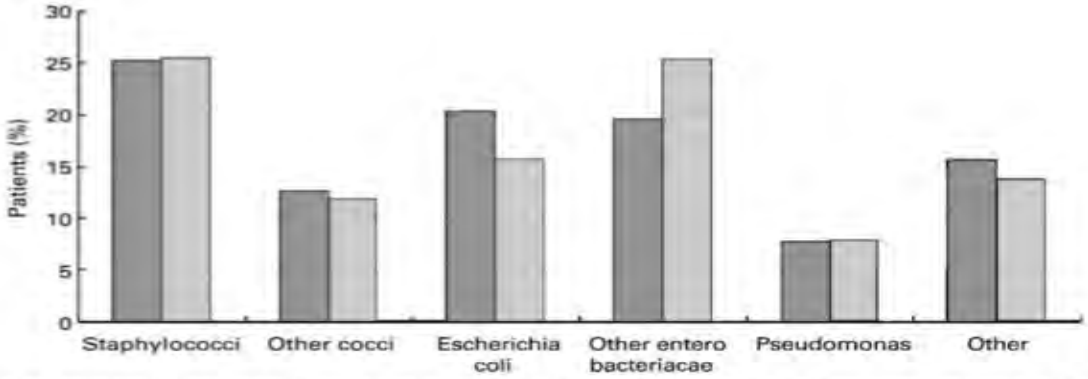


Fig. 2. Main bacteria responsible for nosocomial infections in all patients (*n* 1637) and in patients in whom the nutritional risk index (NRI) was calculated (*n* 630). ■, All patients; ■, NRI population. For details of patients and procedures, see Table 1 and p. 106. Mean values for NRI group were not significantly different from those of all patients: *P*=0·99.

Age and Ageing 2005; **34:** 619–625
doi:10.1093/ageing/afi197

Relations between undernutrition and nosocomial infections in elderly patients

ELENA PAILLAUD[1], STEPHANE HERBAUD[1], PHILIPPE CAILLET[1], JEAN-LOUIS LEJONC[1], BERNARD CAMPILLO[1], PHUONG-NHI BORIES[2]

Table 2. Infection sites of the 103 nosocomial infections

Groups	One infection	>One infection
Urinary tract infections (*n*)	24	39
Respiratory infections (*n*)	11	19
Other infections (*n*)	3	7

The two groups were compared by χ^2 analysis.

Age and Ageing 2005; **34:** 619–625
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Table 3. Anthropometric variables and energy intake in the three groups of patients

	No infection	One infection	>One infection	
n	116	38	31	*P*
Weight (kg)	61.2 ± 1.5	58.9 ± 3.1	51.3 ± 1.7	0.0079
BMI (kg/m^2)	23.8 ± 0.5	24.0 ± 1.2	21.2 ± 0.7	0.046
MAC (cm)	27.1 ± 0.4	26.7 ± 1.0	24.1 ± 0.7	0.011
TST (mm)	11.6 ± 0.5	12.9 ± 1.3	9.5 ± 0.8	0.064
BST (mm)	4.9 ± 0.3	5.9 ± 0.9	3.1 ± 0.3	0.011
Energy intake (kcal/day)	1717 ± 40	1474 ± 91	1284 ± 74	<0.0001
Energy intake (kcal/kg/day)	29.3 ± 0.8	27.2 ± 2.1	25.1 ± 1.4	0.089

BMI, body mass index; MAC, mid-arm circumference; TST, tricipital skinfold thickness; BST, bicipital skinfold thickness.
The three groups were compared by ANOVA.

Age and Ageing 2005; **34:** 619–625
doi:10.1093/ageing/afi197

Relations between undernutrition and nosocomial infections in elderly patients

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Table 4. Biological variables in the three groups of patients

	No infection	One infection	>One infection	
n	116	38	31	*P*
Albumin (g/l)	36.3 ± 0.4	34.6 ± 0.6	31.7 ± 0.9	<0.0001
Transthyretin (g/l)	0.26 ± 0.01	0.23 ± 0.01	0.19 ± 0.01	<0.0001
Orosomucoid (g/l)	2.1 ± 0.7	1.5 ± 0.1	1.6 ± 0.1	0.861
CRP (mg/l)	16 ± 2	37 ± 10	44 ± 8	0.0003
Lymphocytes (g/l)	1.7 ± 0.1	1.8 ± 0.3	1.5 ± 0.1	0.438
PMN leukocytes (g/l)	4.4 ± 0.2	6.1 ± 1.0	6.7 ± 0.7	0.0027

PMN, polymorphonuclear.

The three groups were compared by ANOVA.

Age and Ageing 2005; **34:** 619–625
doi:10.1093/ageing/afi197

Relations between undernutrition and nosocomial infections in elderly patients

ELENA PAILLAUD[1], STEPHANE HERBAUD[1], PHILIPPE CAILLET[1], JEAN-LOUIS LEJONC[1], BERNARD CAMPILLO[1], PHUONG-NHI BORIES[2]

Table 5. Association of clinical characteristics with infection

	No infection	One infection	>One infection	
n	116	38	31	*P*
Urinary catheter	2	6	5	
	1.7%	15.0%	15.6%	0.0015
Difficulty with swallowing	7	2	4	
	5.9%	5.0%	12.5%	0.373
Pressure sores	15	10	9	
	12.7%	25.0%	28.1%	0.055
Outcome				<0.0001
Nursing home	18	9	13	
	15.4%	22.5%	40.6%	
Return home	90	22	10	
	76.9%	55.0%	31.3%	
Death	5	8	9	
	4.3%	20.0%	28.1%	
Hospitalisation	4	1	0	
	3.4%	2.5%	0%	

The three groups were compared by χ^2 analysis.

Poor nutritional habits are predictors of poor outcome in very old hospitalized patients[1,2]

Nadya Kagansky, Yitshal Berner, Nira Koren-Morag, Luiza Perelman, Hilla Knobler, and Shmuel Levy

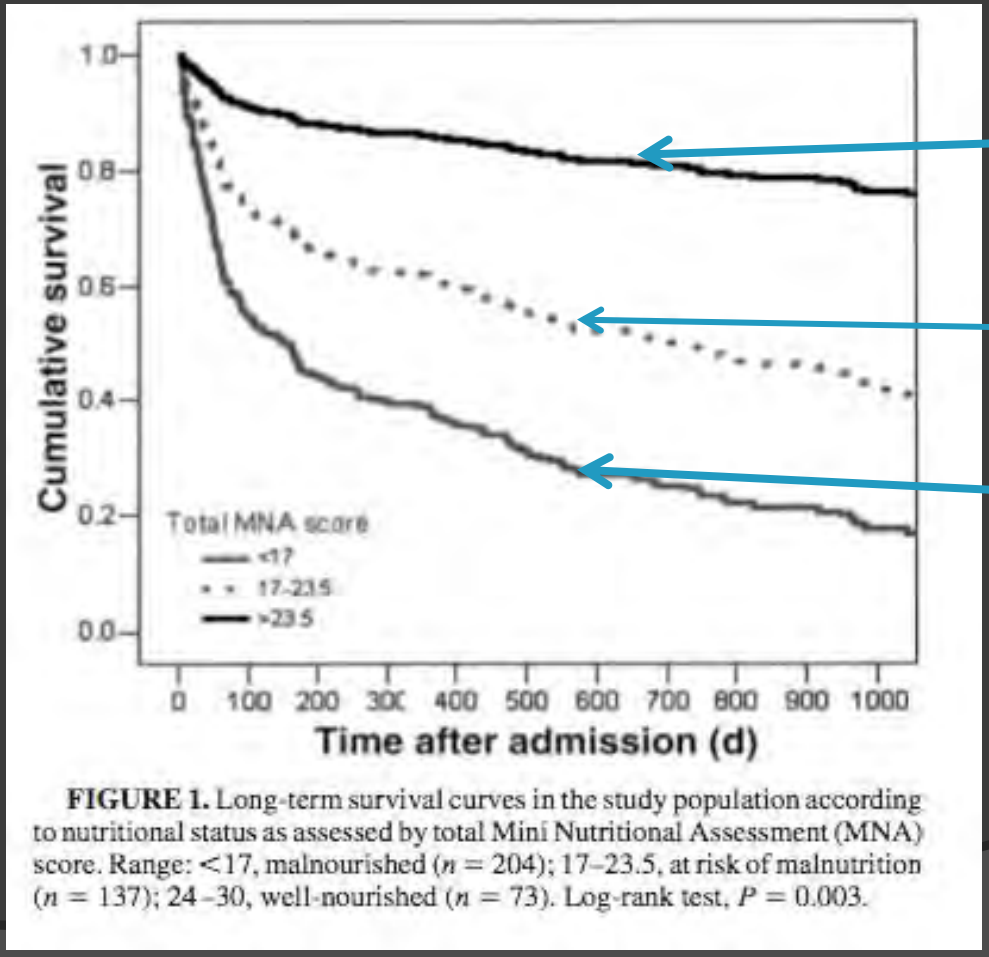


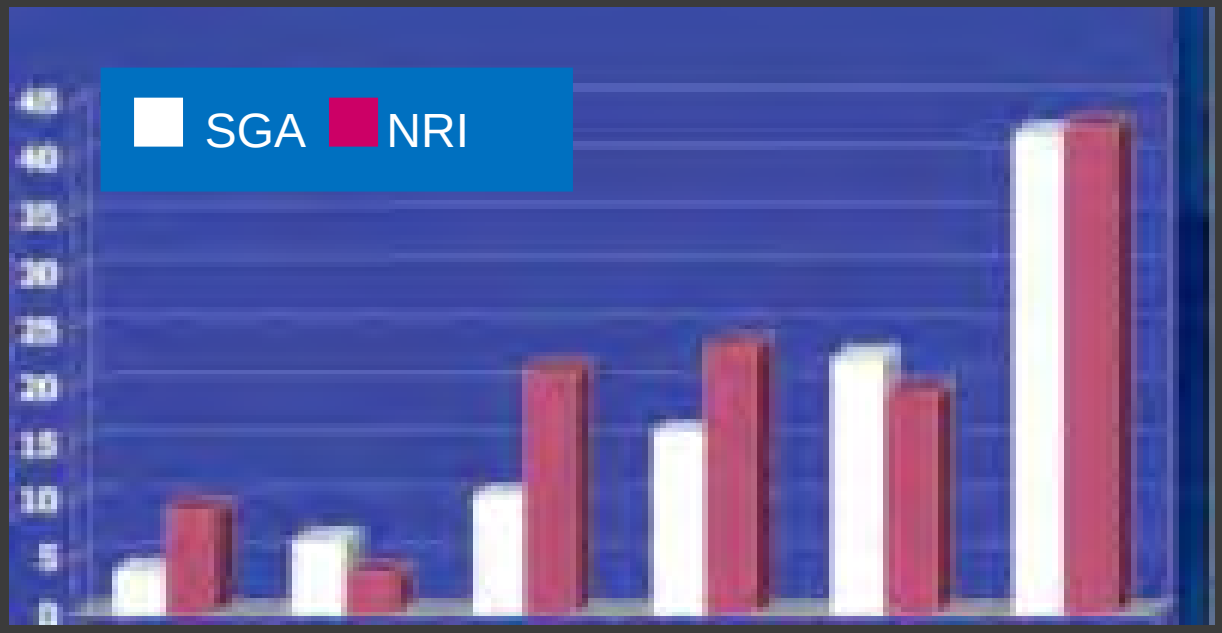
FIGURE 1. Long-term survival curves in the study population according to nutritional status as assessed by total Mini Nutritional Assessment (MNA) score. Range: <17, malnourished ($n = 204$); 17–23.5, at risk of malnutrition ($n = 137$); 24–30, well-nourished ($n = 73$). Log-rank test, $P = 0.003$.

MNA 24-30
Well nourished patients

MNA 17-23.5
Patients at risk of malnutrition

MNA < 17
Malnourished patients

NUTRITION & MORBIDITY

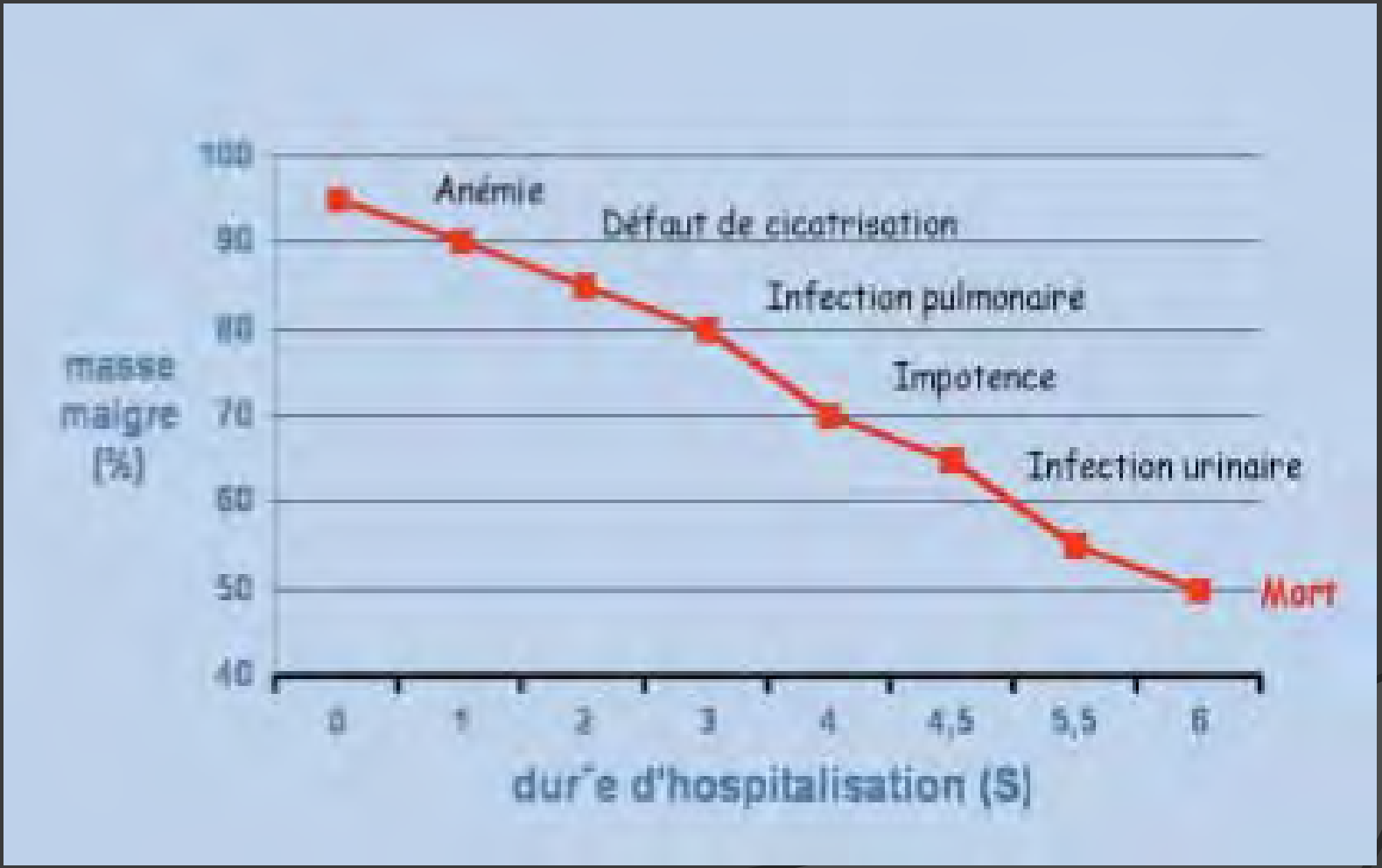


SGA: Subjective Global Assessment
NRI: Nutritional Risk Index

Malnutrition & Mortality

- Number of deaths attributed to malnutrition → difficult to evaluate.
- ***Sullivan's study (1998):*** low serum albumin *increases risk of death* at 5 years.
- ***Middleton's study (2002):*** In 2194 patients, 36% malnourished with a mortality rate at 12 months of 29.7% in the malnourished group & 10.1% in the well-nourished group ($p<0.0005$).

Complications - MaInutrition



Costs - MalNutrition

Duree moyenne de sejour (jrs)

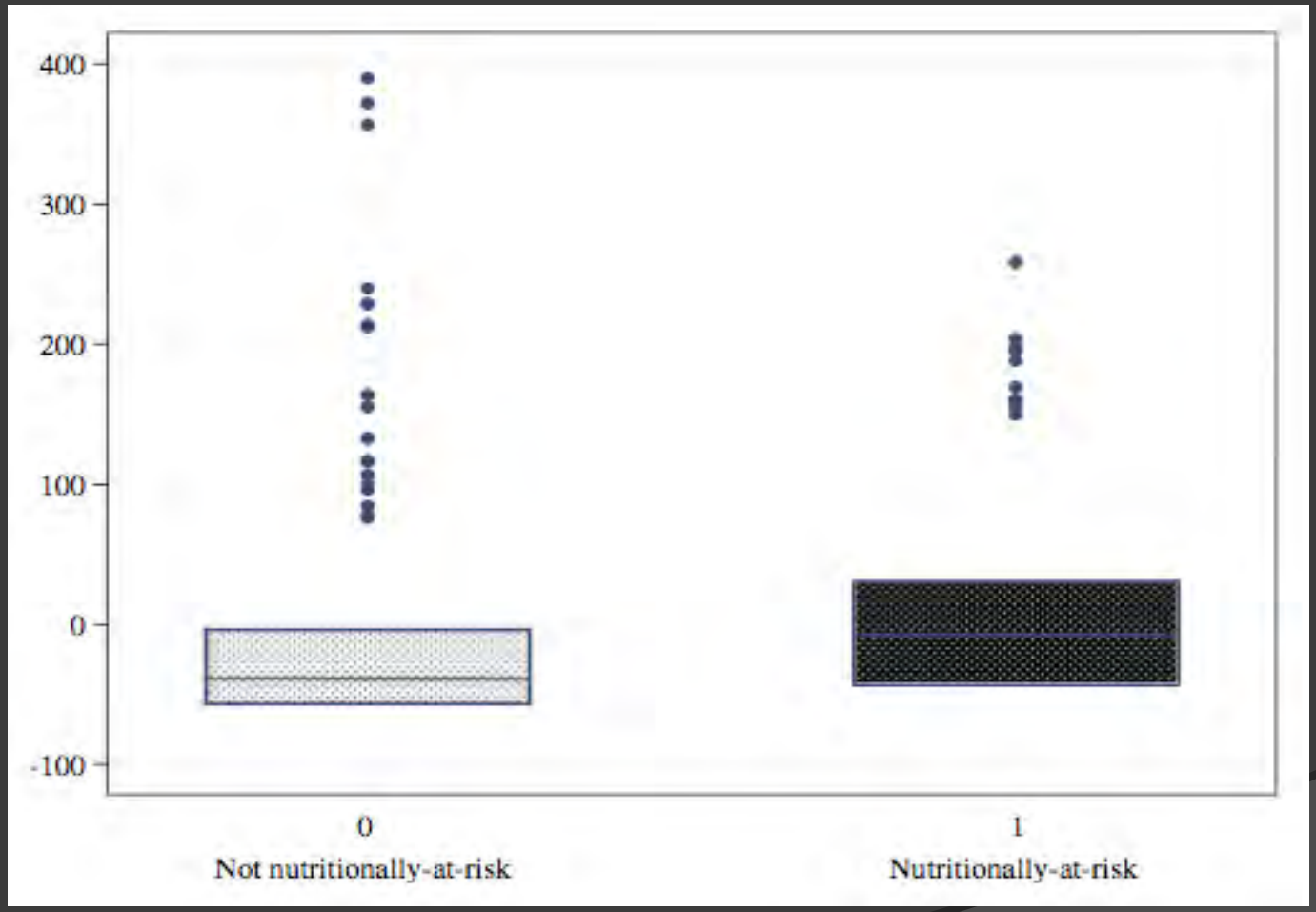
Faible Risque
Risque eleve

Hopital General

CHU

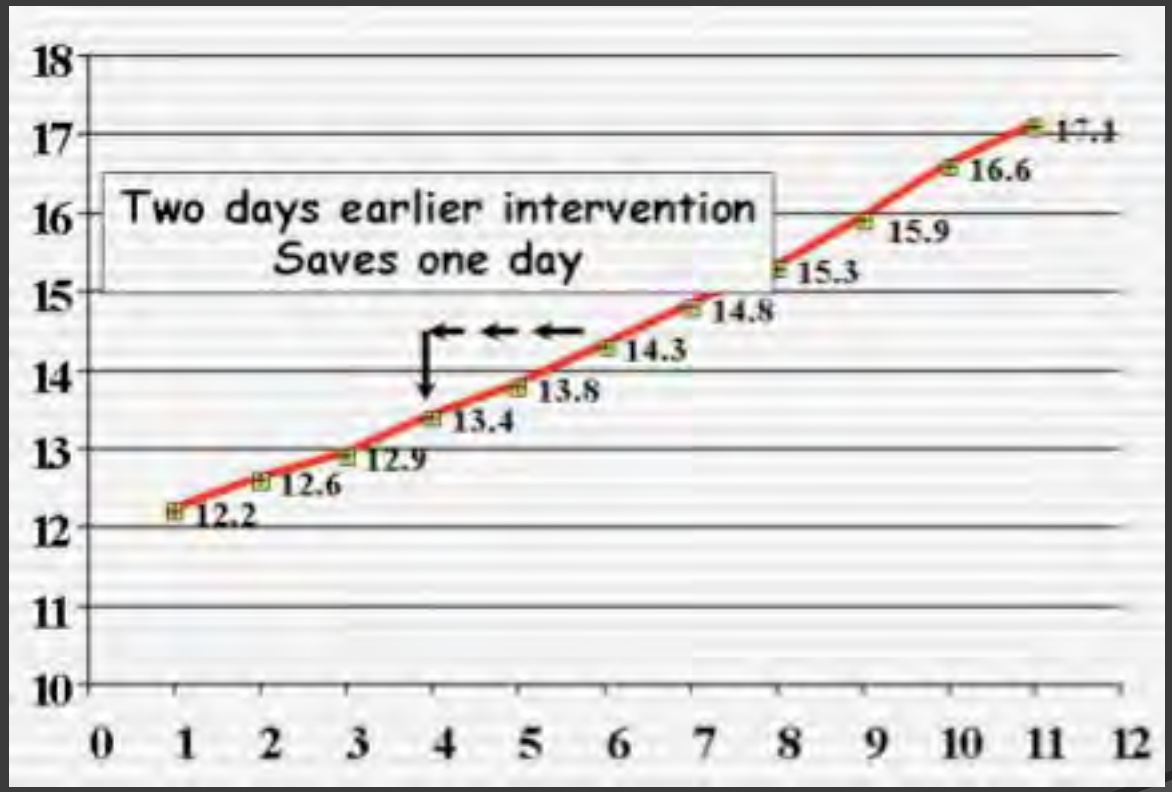
Nutrition Care Management Institute, 1988

Costs - MalNutrition



Boxplot showing the cost deviation with respect to the mean DRG costs in by NRS-2002 (%)

INFLUENCE OF EARLY NUTRITIONAL INTERVENTION OF PATIENTS ON LENGTH OF STAY



Tucker et al., Nutr Reviews, 1996

Supplements - Costs

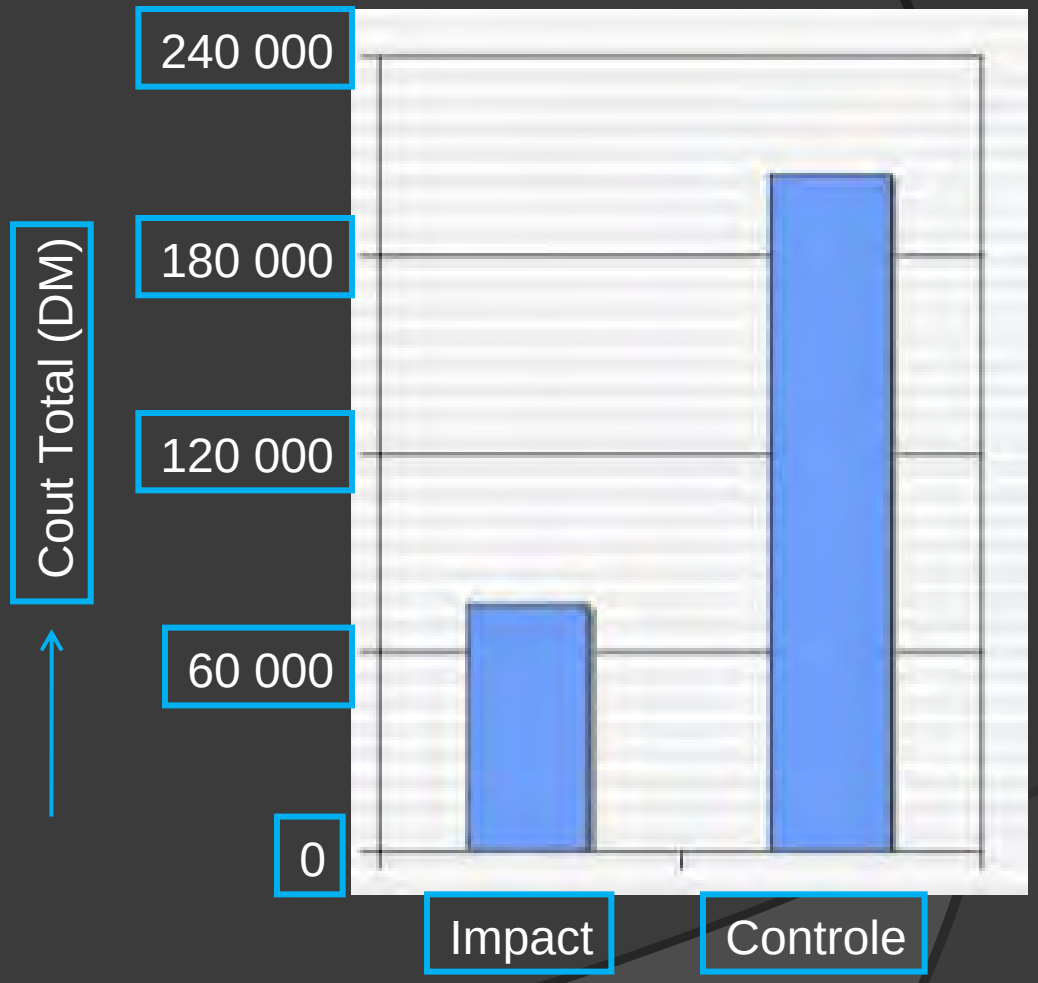
	Groupe non supplemente	Groupe supplemente	Gain
Jours d'hospitalisation	5.6 j	4.3 j	-1.3 j
Nombre d'admission (moy)	0.65 j	0.50 j	-0.15 j
Cout des soins (EUR)	2657 EUR	1934 EUR	-723 EUR
Cout des supplements (EUR)	37 EUR	565 EUR	+528 EUR
Cout total (EUR)	2694 EUR	2499 EUR	-195 EUR

Un exemple de rentabilite d’une intervention nutritionnelle

L'IMMUNONUTRITION

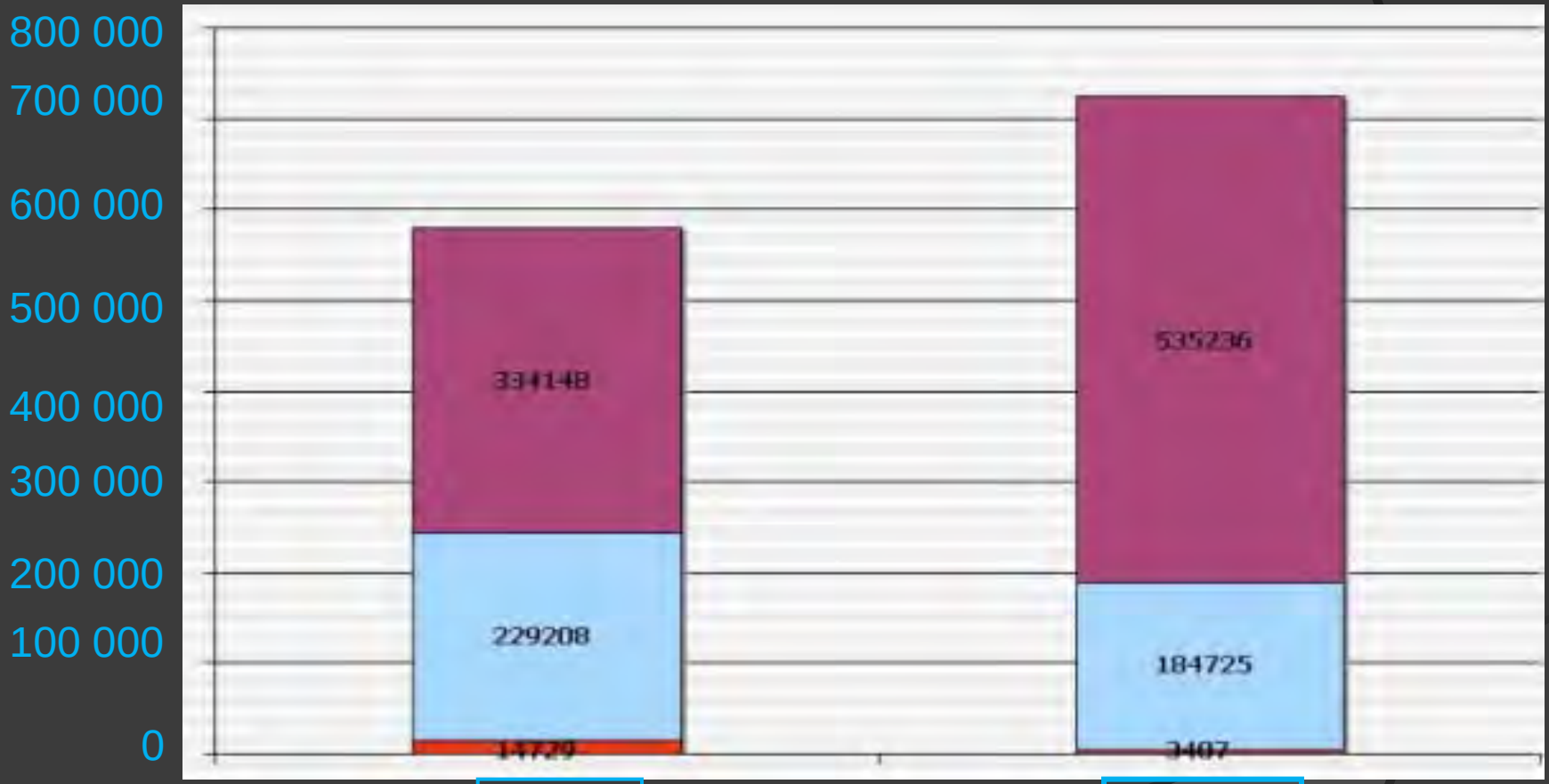
PREMIERE EVALUATION MEDICO-ECONOMIQUE DE L'IMMUNONUTRITION

- 154 malades cancer estomac, pancreas;
- 1L/j pendant et 5j pre-operatoires puis NE debutee en post-operatoire & poursuivie pendant 10j v/s nutrition standard;
- Reduction des complications infectieuses & de la DMS.



Senkal et al, Arch Surg, 1999

Cout global des malades operes



Braga & Gianotti, JPEN 2005

COMPLICATIONS OBSERVEES

Braga & Gianotti, JPEN 2005

	Conventional Group	Preoperative Group	Total
Anastomotic leak	10	4	14
Abdominal abscess	10	4	14
Pancreatic fistula	5	5	10
Wound infection	11	7	18
Respiratory failure	6	6	12
Delayed gastric emptying	5	6	11
Respiratory tract infection	8	3	11
Sepsis	2	0	2
Wound dehiscence	3	3	6
Circulatory insufficiency	4	6	10
Urinary tract infection	5	4	9
Bleeding	4	2	6
Pleural effusion	4	2	6
Bacteriemia	5	0	5
Intestinal obstruction	1	1	2
Renal dysfunction	2	1	3
Overall	85	54	139

Cout des Infections Post-operatoires

Infectious complications, MCG surgery	Incremental cost of Infection, DOLLARS	Incremental LOS with Infection	Breakeven infection rate, well nourished (%)	Breakeven infection rate, malnourished (%)
Septicemia	51 329	9.03	0.10	0.34
Postop UTI	11 084	7.43	2.03	3.16
Postop pneumonia	16 700	12.32	0.43	2.10
Cellulitis/decubitus ulcer	9 192	13.03	0.89	3.26
Postop infections (excl pneumonia, wound)	9 066	15.03	0.91	3.31
Wound infection	7 345	15.44	1.69	4.77

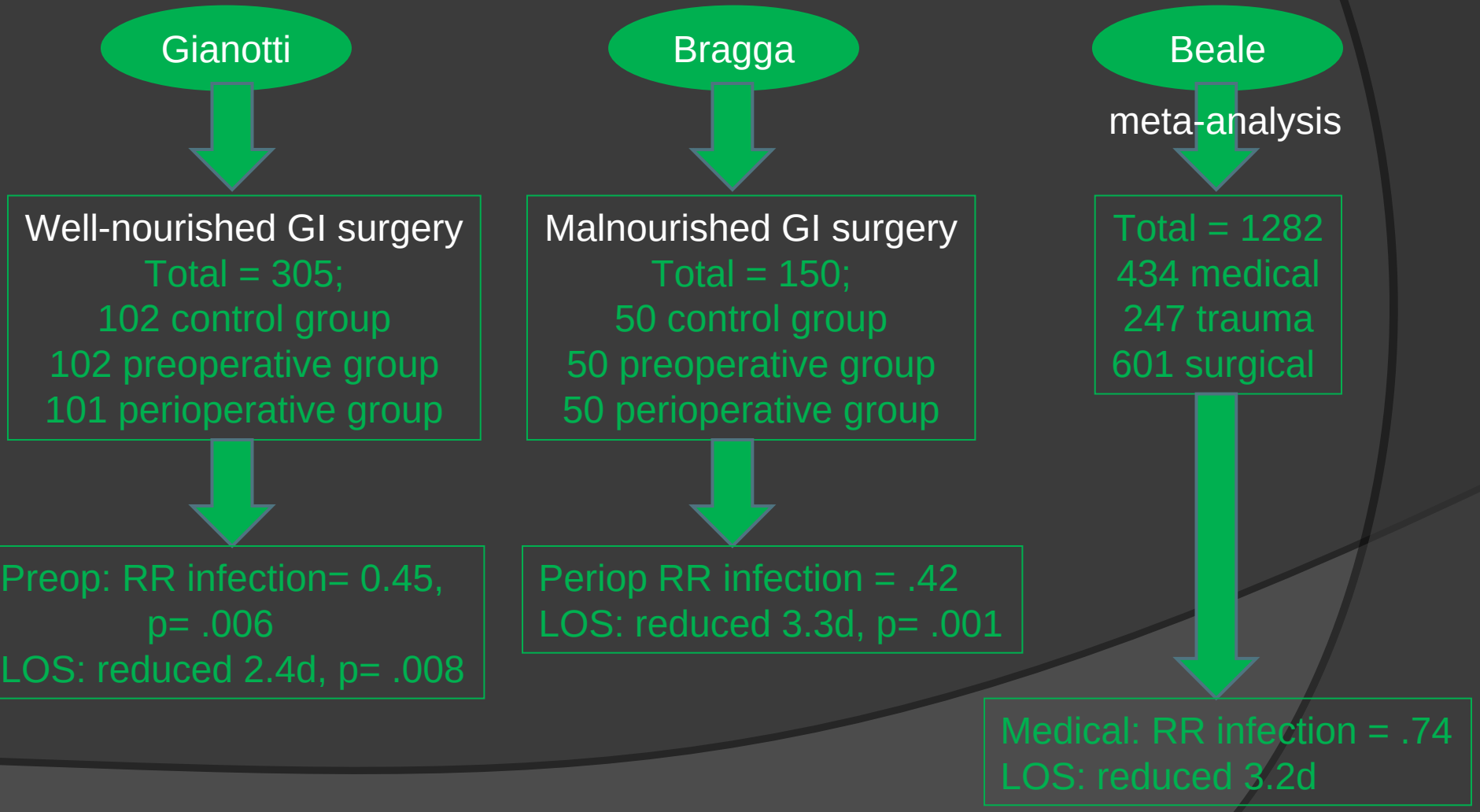
UTI: Urinary Tract Infection; LOS: Length Of Stay.

Strickland et al, JPEN 2005

The **breakeven point** is defined as the point at which the incremental expense exactly equals the incremental savings & therefore there is no economic benefit to the intervention.

> for eg. if the breakeven complication rate for a given patient population is expressed as 0.35%, this means that if your actual rate of complications is greater than 0.35%, it is profitable to give specialized nutritional formulations to that entire patient population.

Principaux resultats des etudes utilisees pour l'analyse medico-economique



Hospital Food, Mortality & Nutrition Study Day

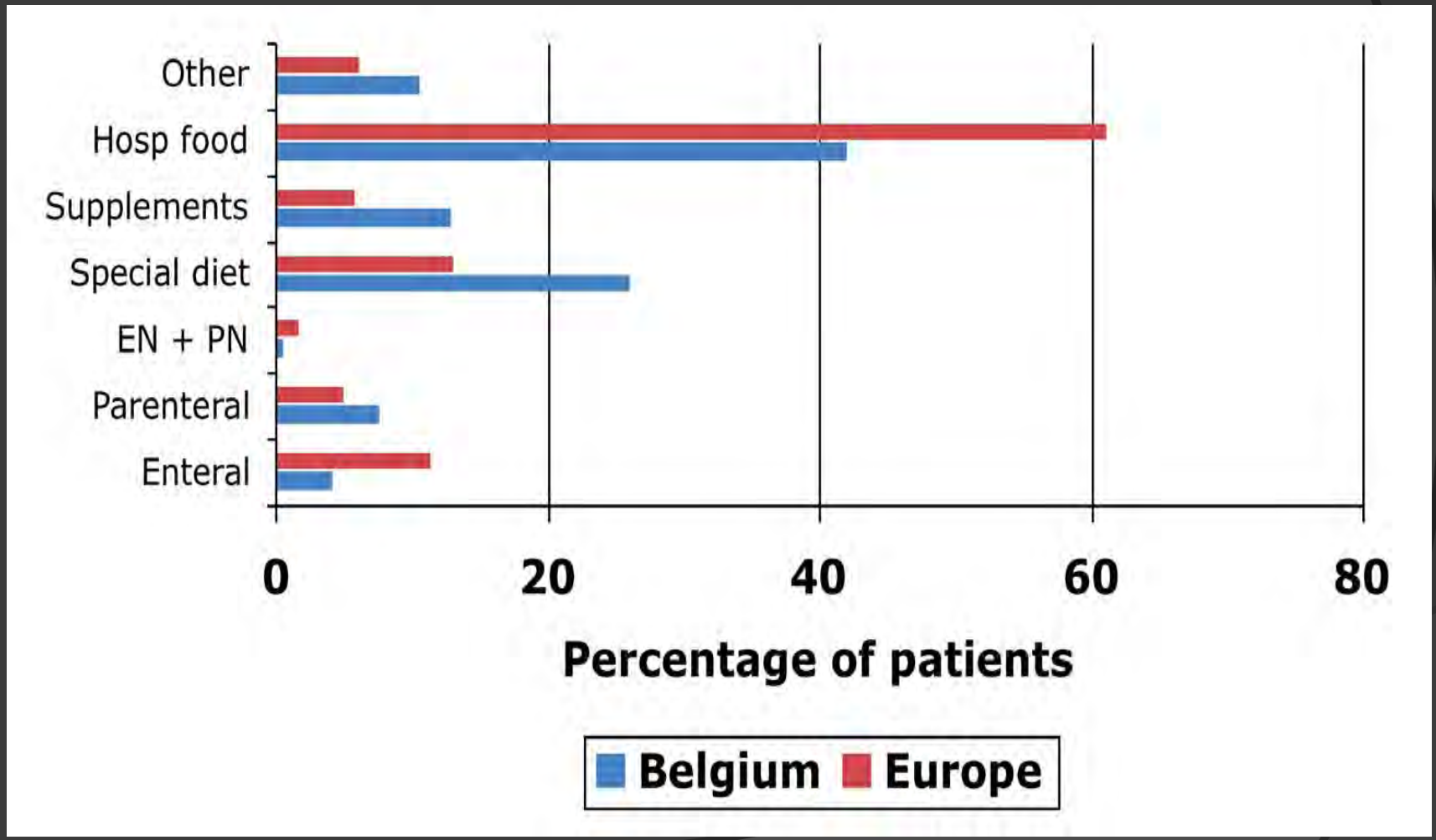
- The evidence-based for the effects of hospital food intake on clinical outcome measures → is weaker
  - for oral nutritional supplements
  - and artificial nutrition.

- The extent to which the:
  - type
  - composition
  - and availability

of hospital food can account for the above outcome *is not clear*.

[Outcome measures =mortality, complications, LOS]

Nutrition, hospital food and in –hospital mortality ppt (data from nutrition day 2008)



Etude Heismayr et al.

Clinical Nutrition 2009;28:484-91.

- Decreased food intake is a major independent risk factor for in – hospital mortality.

Decreased food intake is a risk factor for mortality in hospitalised patients: The NutritionDay survey 2006☆

M. Hiesmayr [a,*], K. Schindler [b], E. Pernicka [c], C. Schuh [d], A. Schoeniger-Hekele [a], P. Bauer [c], A. Laviano [e], A.D. Lovell [f], M. Mouhieddine [a], T. Schuetz [g], S.M. Schneider [h], P. Singer [i], C. Pichard [j], P. Howard [k], C. Jonkers [l], I. Grecu [m], O. Ljungqvist [n], The NutritionDay Audit Team[o]

- Observational study:
  - 16290 patients-Dietary information from 14,655 pts
  - 25 countries, 256 hospitals
  - ≥ 18yrs,748 wards,
- Food Intake assessed on a single day:

  [**The Nutrition Day**]
  - Consumption of:
    - All
    - half
    - quarter or none

    } of the food served on plate

All intake data were related to 30 day in-hospital mortality,
which affected about 4% of the population

Nutritional care in patients according to their food intake at lunch, n = 16,290.

Amounts of food eaten at lunch	n	Type of nutrition provided to the patients (row percentages)						
		Hospital food (%)	Special diet (%)	Protein supplement (%)	Artificial nutrition (%)	Combined (%)	Other (%)	No nutrition care information (%)
All	16,290	59	15	2	9	4	4	7
Complete meal	5509	69	15	1	5	4	2	4
Half meal	3673	64	17	3	6	5	2	4
Quarter meal	1596	59	18	3	8	6	3	3
Nothing (eating allowed)	748	43	14	4	21	7	8	3
Nothing (eating not allowed)	1124	42	11	1	25	3	13	6
Missing	3610	46	12	3	13	4	5	17

Number of snacks consumed on ND Dietary intake in the preceding Week
Adjustment variables such as Age, autonomy,& disease related factors

Decreased food intake is a risk factor for mortality in hospitalised patients: The NutritionDay survey 2006☆

M. Hiesmayr [a,*], K. Schindler [b], E. Pernicka [c], C. Schuh [d], A. Schoeniger-Hekele [a], P. Bauer [c], A. Laviano [e], A.D. Lovell [f], M. Mouhieddine [a], T. Schuetz [g], S.M. Schneider [h], P. Singer [i], C. Pichard [j], P. Howard [k], C. Jonkers [l], I. Grecu [m], O. Ljungqvist [n], The NutritionDay Audit Team [o]

Nothing eaten

All eaten

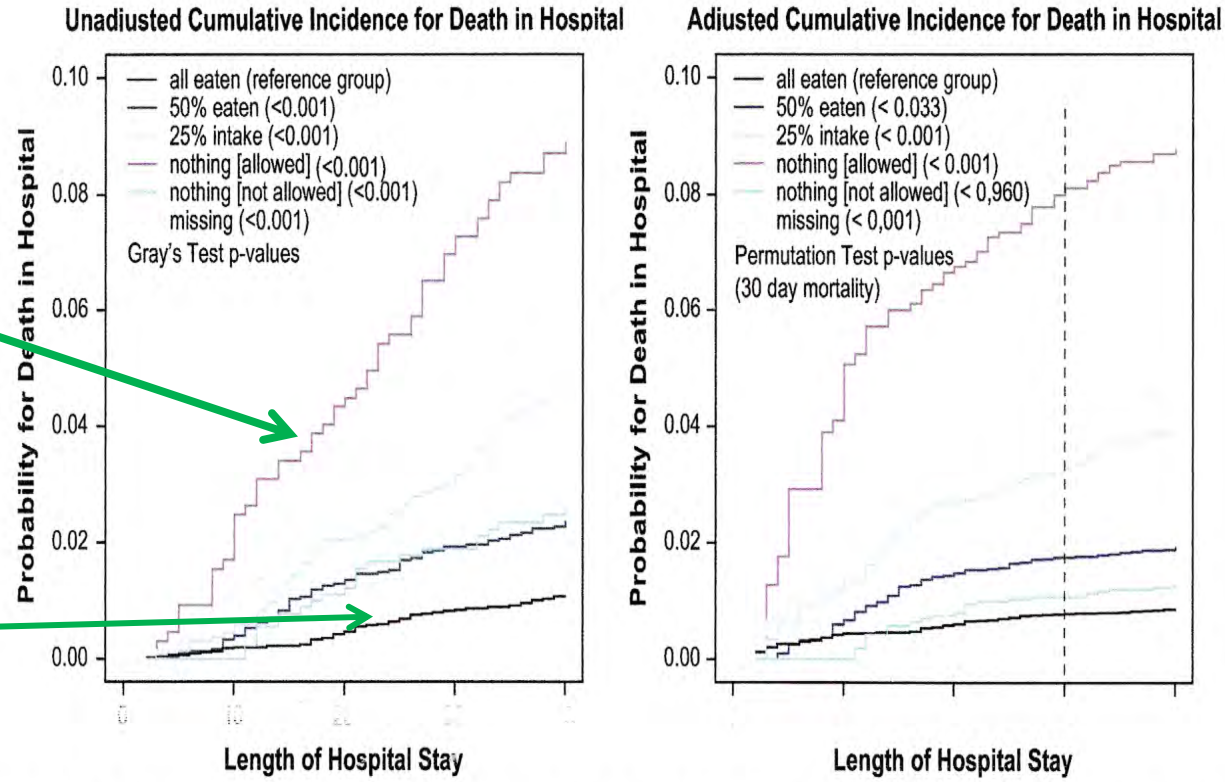
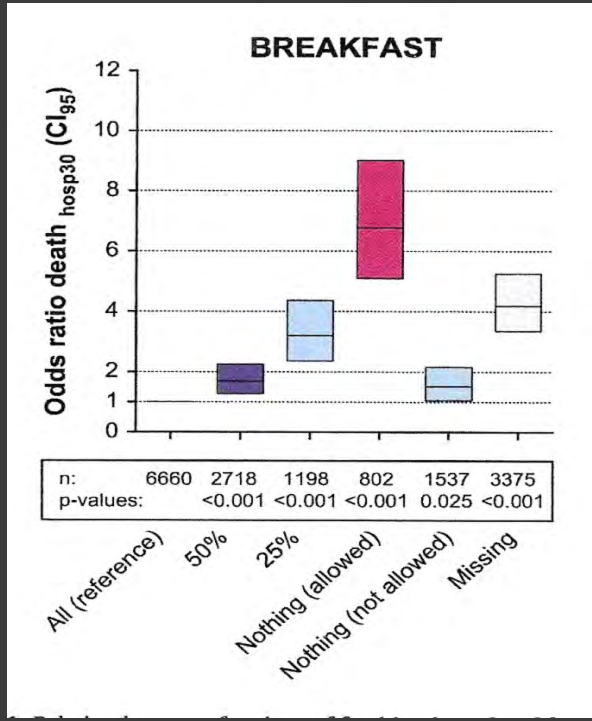
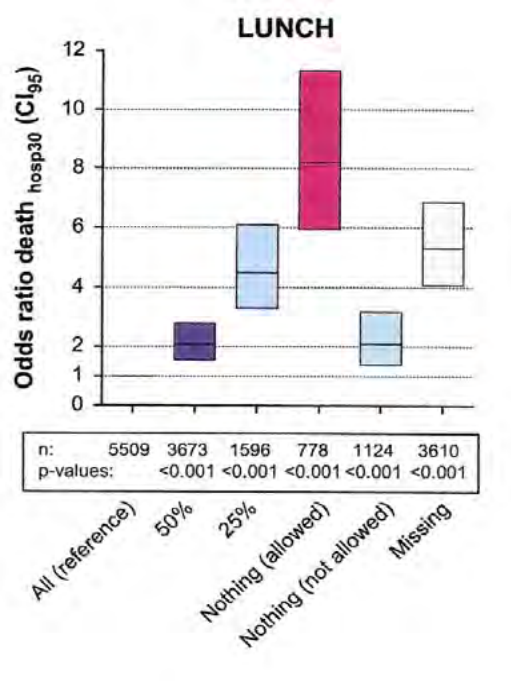
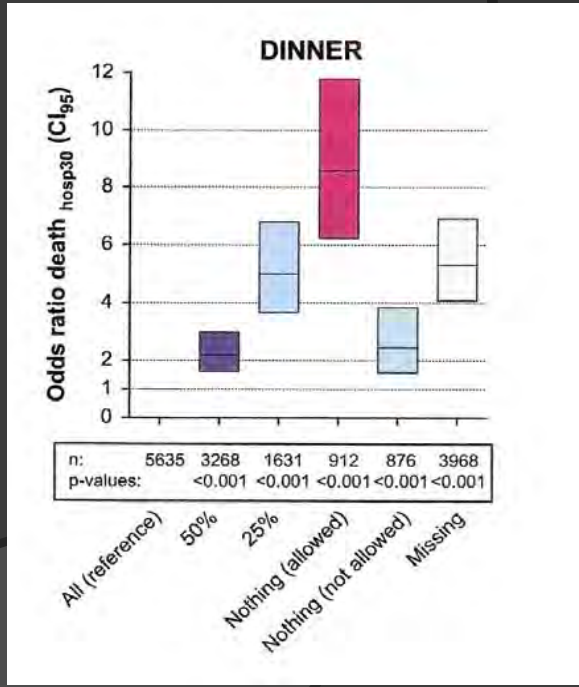


Fig. 2. Unadjusted and adjusted cumulative incidence of death depending on food intake at lunch versus length of stay in hospital. Adjustment is for length bias of the cross-sectional data collection and censoring at day 30 after inclusion, $n = 12{,}727$.

Mortality progressively rising as intake decreased : for all three meals







Independent risk factor for mortality

- Snack ingestion:
  Hazard Ratio 0.81/snack consumed on the nutrition day (p=0.0023)

- How well patients ate the previous week.

Compared to those that ate normally in the previous week (HR= 1.00), the HR for those that ate a little bit less than normal, less than half of normal, and less than a quarter of normal intake ranged from 1.54-2.01

Multivariate analysis of the association between risk indicators and mortality ($n = 12{,}727$).

Variable	HR (95% CI)	p-Value
Patient and nutrition		
BMI		
Underweight <18.5 kg/m^2 ($n = 815$)	1.46 (1.12–1.91)	0.004
Normal 18.5–25 kg/m^2 ($n = 5331$)	1.0	Reference
Overweight 25–30 kg/m^2 ($n = 3797$)	0.80 (0.64–1.00)	0.054
Obese 1 30–35 kg/m^2 ($n = 1502$)	0.62 (0.43–0.89)	0.010
Obese 2 35–40 kg/m^2 ($n = 441$)	0.68 (0.35–1.29)	0.238
Obese 3 >40 kg/m^2 ($n = 204$)	1.21 (0.59–2.51)	0.602
Missing ($n = 637$)	1.09 (0.81–1.47)	0.580
Have you lost weight unintentionally within the last 3 months?		n.s.
How well have you eaten during the last week?		
Normal ($n = 5013$)	1.0	Reference
A bit less than normal ($n = 2611$)	1.54 (1.11–2.13)	0.009
Less than half of normal ($n = 1646$)	2.01 (1.47–2.75)	<0.0001
Less than a quarter to nothing ($n = 1250$)	1.93 (1.40–2.66)	0.0001
Missing ($n = 2207$)	2.39 (1.63–3.50)	<0.0001
Part of dish patient ate at lunch		
All ($n = 4477$)	1.0	Reference
About 50% ($n = 2999$)	1.28 (0.93–1.75)	0.123
About 25% ($n = 1323$)	1.97 (1.42–2.71)	<0.0001
Nothing (eating allowed, $n = 644$)	2.71 (1.88–3.91)	<0.0001
Nothing (eating not allowed/examination, $n = 898$)	1.62 (1.03–2.53)	0.036
Missing ($n = 2386$)	1.90 (1.28–2.82)	0.001
Number of snacks eaten during the NutritionDay		
Number of snacks	0.81 (0.70–0.93)	0.0023
Missing ($n = 3730$)	0.98 (0.75–1.28)	0.899

Is reduced food intake a cause or a marker of increased mortality?

- Sicker people eat less food

it *may* be the disease and not the food intake, that is the cause of mortality.

- Distinguishing between these two possibilities, or establishing the extent to which they operate simultaneously is of considerable importance to clinical practice.

5 disease-related factors

- Disease affected organ systems
- Comorbidities
- Previous ICU stay
- Number of days patients spent in hospital before Nutrition Day
- Number of drugs taken daily

Reflect disease severity

Multivariate analysis of the association between risk indicators and mortality ($n = 12{,}727$).

Variable	HR (95% CI)	*p*-Value
Demographic		
Age[a]	1.28 (1.21–1.37)	<0.0001
Gender		n.s
Disease related		
Affected organ (ICD-10 groups)[b]		
Cancer ($n = 1940$)	1.84 (1.46–2.31)	<0.0001
Lung ($n = 1818$)	1.31 (1.06–1.61)	0.012
Liver ($n = 912$)	1.77 (1.37–2.29)	<0.0001
Endocrine system ($n = 744$)	0.57 (0.35–0.93)	0.025
Skeleton/bone/muscle ($n = 1850$)	0.60 (0.44–0.82)	0.014
Comorbidity		
No comorbidity marked ($n = 5313$)	1.0	Reference
Cardiac insufficiency ($n = 1266$)	1.37 (1.09–1.73)	0.007
Diabetes, stroke, COPD		n.s
Myocardial infarction, others		n.s
Any ICU stay before NutritionDay		n.s
Days already in hospital on NutritionDay[c]	1.02 (1.01–1.04)	0.006
How many drugs do you take each day?		n.s
Structural factor		
Specialty[d]		
General internal medicine ($n = 2631$)	1.0	Reference
Neurology ($n = 584$)	0.38 (0.20–0.72)	0.003
Surgery ($n = 2096$)	0.54 (0.38–0.76)	0.0004
Unit size (maximum beds)		n.s
Nutrition care services		n.s
Autonomy		
Can you walk without assistance?		
Yes ($n = 7237$)	1.0	Reference
No, only with assistance ($n = 2161$)	2.04 (1.52–2.74)	<0.0001
No, I stay in bed ($n = 1302$)	3.39 (2.52–4.57)	<0.0001
Missing ($n = 2027$)	2.65 (1.77–3.95)	<0.0001
Did anyone help you to complete this questionnaire?		
No ($n = 5896$)	1.0	Reference
Yes ($n = 5887$)	1.45 (1.11–1.89)	0.007
Missing ($n = 944$)	0.63 (0.47–0.86)	0.003

2 factors must be accounted for

- Social factors which are known to prolong LOHS (Elderly)
- Timing of ND in relation to the phase of illness
  - eg. shortly after hosp admission,
  - whilst other with same condition were probably ready for discharge

Inter-related variables: Disease and food intake: Evidence from other RCT

- Nutritional oral supplements:
  - can increase total nutritional intake and reduce mortality.
    (Stratton *et al*., CAB International, 2003 & Milne *et al*., Ann Intern Med, 2006).
  - snacks and the choice between *liquid supplements/drinks and solid snacks* could be relevant to some patient groups.
- malnourished elderly patients with fractured femur: clinical benefits were greater when liquid nutritional supplements were consumed compared to solid snacks.

  (Stratton *et al*., Clin Nutr, 2007).

BMI- mortality paradox

- Highest mortality in underweight individuals (BMI<18.5 Kg/m2)
- And the lowest in the obese (hazard ratio 0.63 for the BMI range 30-35 and 0.68 for the range 35-40 Kg/m2)
- This pattern *differs* from the normal *BMI mortality curve* for healthy people in the general population (BMI 20-25 = lowest mortality)
- The paradox exist in that obesity is associated with increased risk of death in a healthy population, whereas in the hospital population (BMI 30-40) seems to be associated with the lowest risk of death.

Multivariate analysis of the association between risk indicators and mortality ($n = 12,727$).

Variable	HR (95% CI)	*p*-Value
Patient and nutrition		
BMI		
Underweight <18.5 kg/m^2 ($n = 815$)	1.46 (1.12–1.91)	0.004
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Missing ($n = 637$)	1.09 (0.81–1.47)	0.580

Several studies supporting the paradox in obese patients

- In critically ill patients.

(Diaz et al., J Trauma 2009; Newell et al., J Am Coll Surg 2007, Ray et al., Chest 2005 & Sakr et al., Intensive Care Med 2008).

- In mechanically ventilated patients with ALI (lowest mortality with BMI 35-40).

(O'Brien et al., Crit Care Med 2006).

- In patients undergoing cardiac surgery.

(Shirzad et al., Minerva Chir 2009 & Syrakas et al., Thorac Cardiovasc Surg 2007).

- In patients undergoing CABG (lowest mortality associated with BMI 30).

(Jin et al., Circulation 2005).

Others report elevated BMI is associated with reduced in-hospital mortality

- In elderly patients with diabetes (lowest mortality associated with a BMI>28 kg/m^2).

(Weiss et al., Diabet Med 2009).

- In patients with heart failure (lowest mortality associated with highest BMI quartile 27.8-33.3).

(Fonarow et al., Am Heart J 2007).

- In patients undergoing abdominal surgery for cancer.

(Merkow et al., J Am Coll Surg 2009 & Mullen et al., Ann Surg Oncol 2008).

In outpatients

- Obesity and overweight have been linked to lower mortality,

  eg. Heart failure

  (Curtis et al., Arch Intern Med 2005).

  Cardiovascular diseases

  (Barba et al., Eur J Cardiovasc Prev Rehabil 2009).

Free living subjects

- Obesity has been reported to have a protective effect on mortality in renal failure:
  - Haemodialysis (Zamora et al., Rev Esp Cardiol 2007).
  - but in DP (Johnson et al., Perit Dial Int 2007).
  - coronary disease (Uretsky et al., Am J Med 2007).
  - stroke (Olsen et al., Neuroepidemiology 2008).
  - rheumatoid arthritis (Escalante et al., Arch Intern Med 2005).
  - severe chronic obstructive airway disease (Landbo et al., Am J Respir Crit Care Med 1999).

Underlying reasons for obesity-survival paradox

unclear

Energy intake: DP absence of this paradox: because of absorption of surplus glucose energy from the dialysate placed into the peritoneal cavity

Surplus glucose without essential nutrients *may* predispose to an unbalanced nutritional milieu with detrimental effects on mortality, especially in the more well nourished obese individuals who have been reported to have better markers of nutritional status

Surplus glucose *may* also have some beneficial anticatabolic effects especially in thinner individuals who are already depleted of lean tissue

Some questions remain

If obesity generally increases the risk of disease but then delays death once disease has been established, what is the optimal BMI for survival during the entire journey from health to disease and finally to death ?

Once certain diseases develop would it be advantageous to increase dietary intake to establish overweight or obesity?

Importance of hospital food

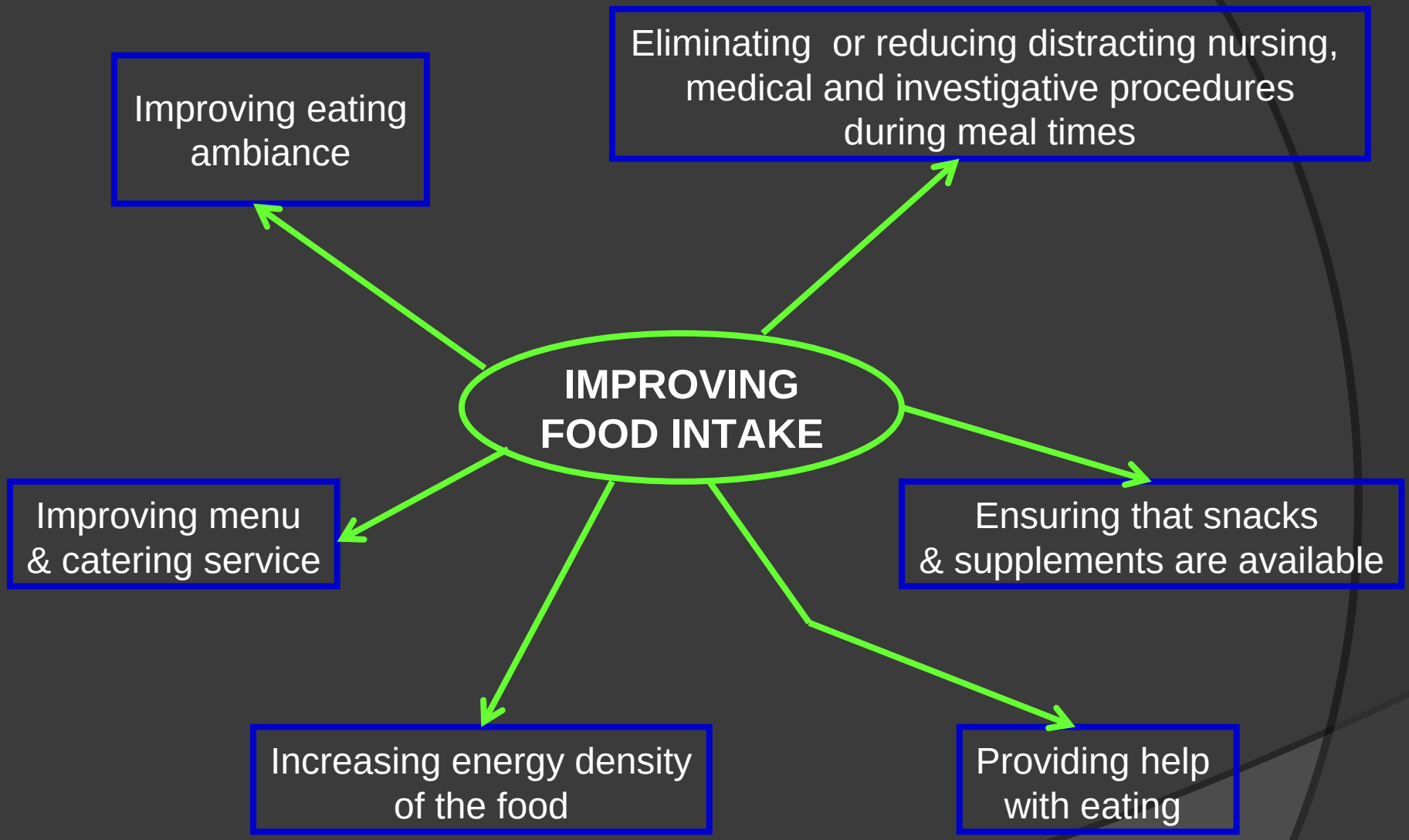
- Mortality highest in the lowest BMI <18.5, *increasing further* when proportion of plated food eaten was reduced, and *increasing further still* when no snacks were taken.

Summary

Malnutrition predisposes to disease, delays recovery from illness, and increases mortality.

Increased dietary intake from appropriate nutritional support can improve all of these outcomes.

Dietary intake of hospitalized patients is often inadequate, consistent with cross sectional data from ND.


IMPROVING FOOD INTAKE
Improving eating ambiance
Eliminating or reducing distracting nursing, medical and investigative procedures during meal times
Improving menu & catering service
Ensuring that snacks & supplements are available
Increasing energy density of the food
Providing help with eating

Much malnutrition continues to be under-recognised & undertreated in hospitals despite guidelines on nutritional support, including guidelines on hospital food which are available in several countries.

(Scottish Government: Food in Hospitals, 2008)
(Health Do: Nutrition Guidelines, 1996)
(Kluthe et al., Aktuel Ernaehr Med 2004)

Partly because *inadequate attention is paid to food intake*. Until attitudes change & hospital food becomes embedded in routine care as a governance issue, rather than a hotel service issue, the situation is unlikely to improve rapidly.

conclusions

1. Dans la majorité des cas, la dénutrition du malade hospitalisé est la conséquence d'une maladie aiguë ou chronique & est l'un des témoins de la gravité de l'affection responsable de l'hospitalisation.

2. Les patients les plus à risque de dénutrition sont : sujets agés, ceux atteints de cancer, maladie digestive, ou d'affection chroniques, & ceux hospitalisés pour une longue durée.

3. Malgré les progrès récents, la dénutrition reste insuffisament diagnostiquée & insuffisamment traitée à l'hôpital.

4. La dénutrition s'aggrave chez un nombre important de malades pendant l'hosptalisation, suggérant une prise en charge inadaptée.

conclusions

5. La dénutrition est associée à un accroissement de la:
durée moyenne de séjour,
morbidité & dans certaines études,
mortalité.

6. Des travaux récents suggèrent que
la dénutrition est un facteur de risque indépendant de complications
chez le malade hospitalisé;
ces résultats justifient le développement du dépistage &
de la prise en charge précoce de la dénutrition des l'admission à l'hôpital.

7. La prise en charge précoce du malade dénutri est
susceptible d'améliorer son pronostic.

MERCI DE VOTRE ATTENTION, OALEED NOORDALLY, M.D.