



The Prevalence and Impact of Malnutrition in Canadian Hospitals: MIND THE GAP

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Conflict of Interest

- Speakers Bureau – Abbott Canada
- Speakers Bureau, Advisory Board – Baxter Canada/Global



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Learning Objectives: Malnutrition in Canadian Hospitals – Mind the GAP

- To describe CMTF and the Nutrition Care in Canadian Hospitals study
- To provide an overview of malnutrition, contributing factors, and impact on outcome
- Summarize patient-level results (n=1022)
- To discuss results and relevance to nutrition care in Canadian Hospitals including health professional perspectives
- To discuss best practice methods for achieving nutrition care goals in the hospital environment



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The Canadian Malnutrition Taskforce (CMTF)

A taskforce, made up of researchers, dietitians and clinicians from hospitals and universities across Canada

Mission

To create awareness about the gaps in preventing, detecting and treating malnutrition in hospitals, LTC, and in older adults in the community.

Vision

To create knowledge and close the gaps between research and practice in the prevention, detection, and treatment of malnutrition in Canadians through the continuum of care.



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Who Is the CMTF?

Johane Allard, MD, FRCPC	Ontario
Paule Bernier, PDt, MSc	Quebec
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Leah Gramlich, MD, FRCPC	Alberta
Khursheed Jeejeebhoy, MBBS, PhD, MRCP, FRCP	Ontario
Heather Keller, RD, PhD, FDC	Ontario
Manon Laporte, RD, MSc, CNSC	New-Brunswick
Hélène Payette, PhD	Quebec

Support

Bridget Davidson, RD, MSc	National Study Coordinator
Elisabeth Vesnaver, PhDc	Statistics
Bianca Arendt, PhD	



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MALNUTRITION / UNDERNUTRITION

Malnutrition: What It Is

- Malnutrition:

A state of nutrition in which deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measurable adverse effects on tissue, body form and function, and clinical outcome¹

- Under-nutrition:

A state of deficient energy or protein intake or absorption; often described as protein-energy malnutrition (PEM)

Characterized by:

- Weight loss
- Body composition changes

- In this presentation, malnutrition means under-nutrition

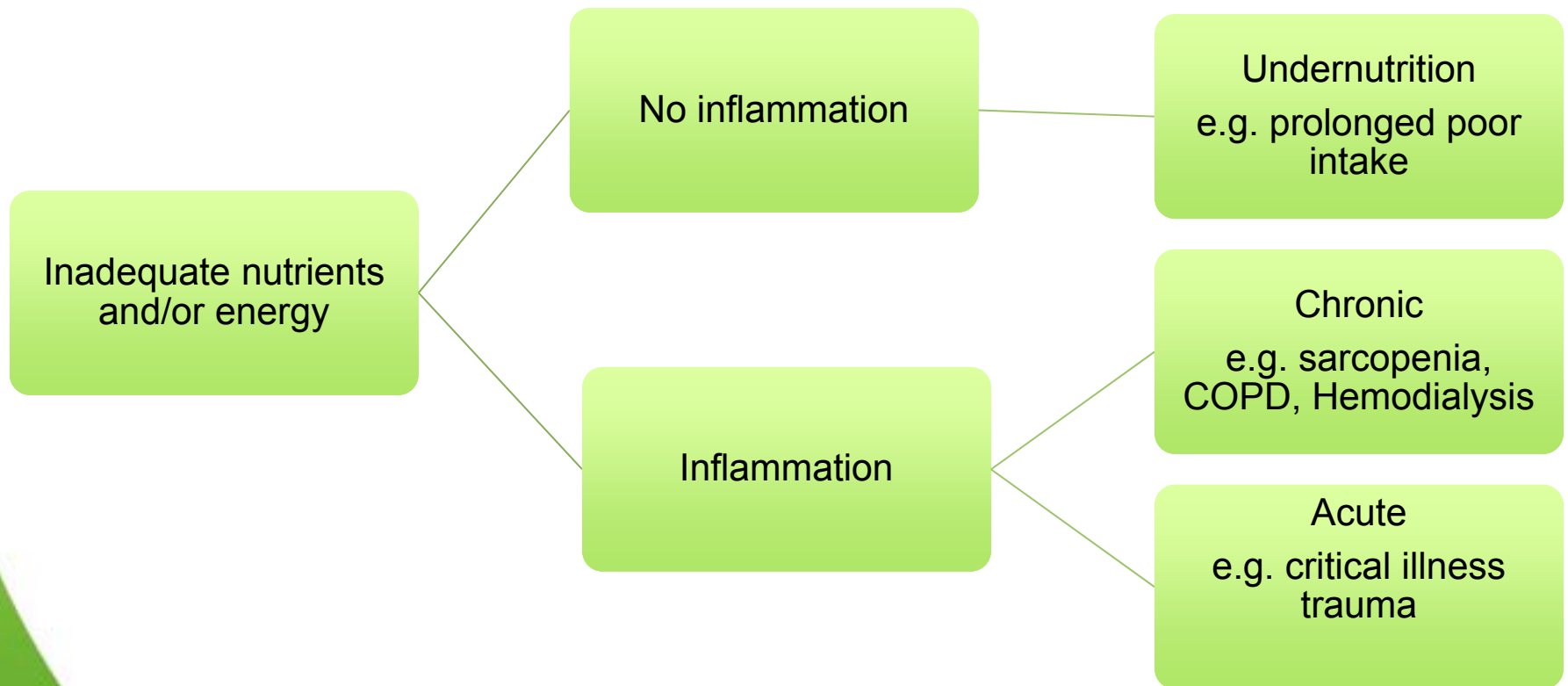
1. Lochs H, et al. *Clin Nutr.* 2006;25:180-186.

2. Butterworth CE. *Nutr Today.* 1974;9:94-98.



Adult Starvation and Disease-Related Malnutrition

(Jensen et al., 2010)



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Prevalence of Hospital Malnutrition: Subjective Global Assessment

28-76%

69% moderate or severe using SGA; Canadian tertiary care general medical ward Singh H et al. *Nutrition* 2006;22;350-354

TABLE I.

FREQUENCY OF MODERATE OR SEVERE UNDERNUTRITION IN ACUTE HOSPITALS IN STUDIES USING THE SGA CRITERIA*

Admission site	Moderate or severe SGA	Country	Year
Acute hospital (CRI admission) ¹	28% (severe)	Australia	2001
Acute hospital (<i>n</i> = 2) ²	36% (severe)	Australia	1997
Acute hospital ³	45% (severe)	Netherlands	1997
Acute geriatric hospital ⁴	41%	USA	1999
Acute hospital (<i>n</i> = 13)	50%	Latin America	2001
Acute hospital ⁵	53%	Sweden	1996
Acute hospital ⁶	61%	Switzerland	2002
Acute hospital (dialysis) ⁷	65%	United Kingdom	1997
Acute geriatric hospital ⁸	69%	Sweden	2002
Geriatric long-term care ⁹	70%	USA	2000
Oncology ¹⁰	76%	Australia	2002

* Only studies using the SGA were included. Several studies reported combined moderate and severe undernutrition, whereas others reported only severe undernutrition.

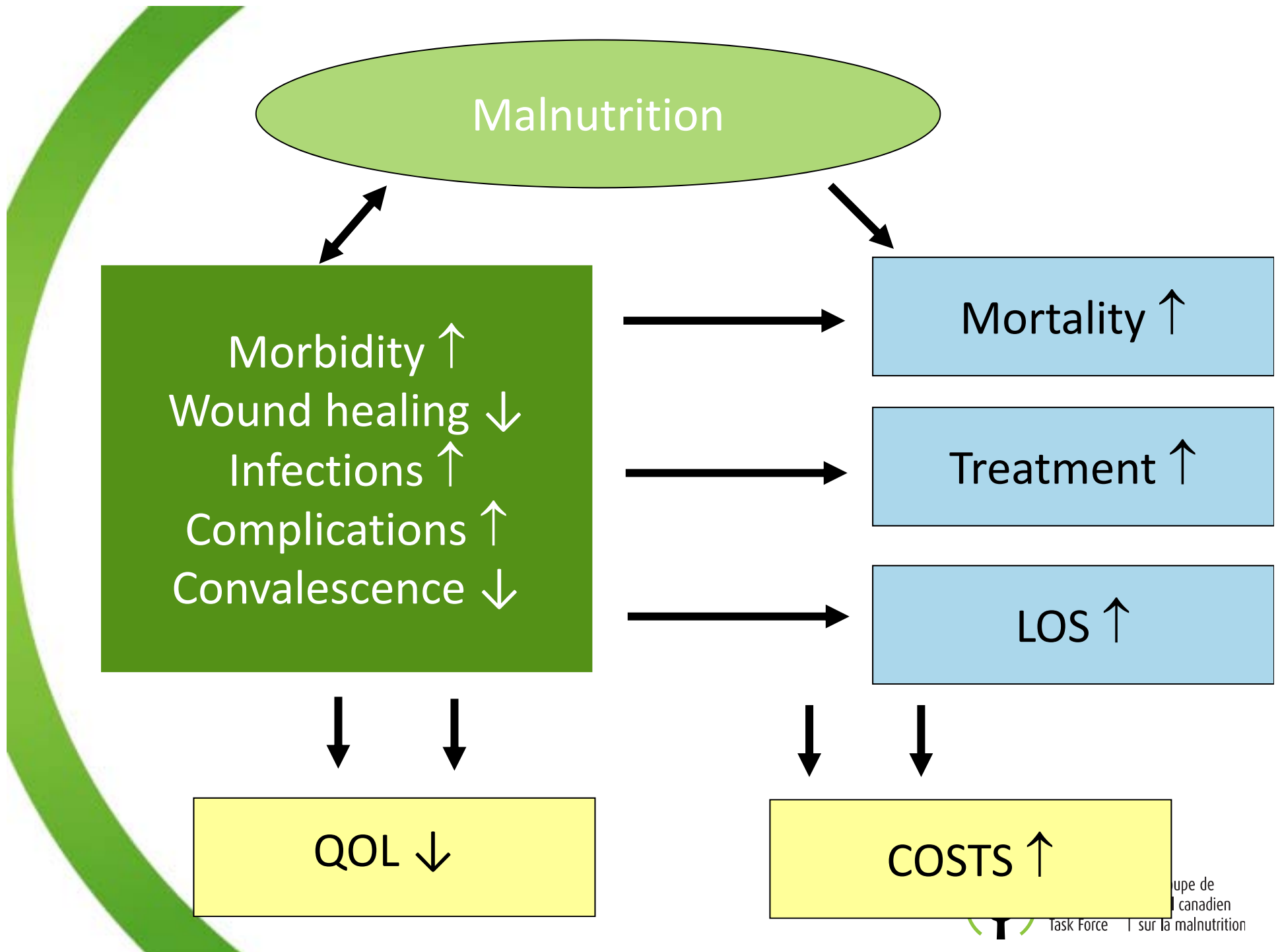
CRI, chronic renal insufficiency; SGA, Subjective Global Assessment

Thomas DR Starving in the hospital. *Nutrition*. 2003; 19:907-8



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Increased Morbidity

- ↑ Infections:

- UK study – increased infections (0.4 vs 0.2 new infections) in malnourished patients
- Malnutrition shown to be an independent risk factor for nosocomial infections
- 14.6% in severely malnourished patients vs. 4.4% in well-nourished patients

- ↑ Complications:

- Malnourished patients had an increased risk of complications during hospital stay vs. well-nourished patients (OR: 3.3 [unadjusted]; 1.7 [adjusted])
- Malnourished patients had 3 to 7 times the risk of life-threatening complications while in the hospital
- Complications are significantly higher in malnourished patients (27.0% vs 16.8%)

Clin Nutr 2000, Br J Nutr 2004; 92: 105-111, AJCN 1997; 66: 1232-1239, J Gen Intern Med 2002; 17: 923-932, Clin Nutr 2003; 22: 235-239.

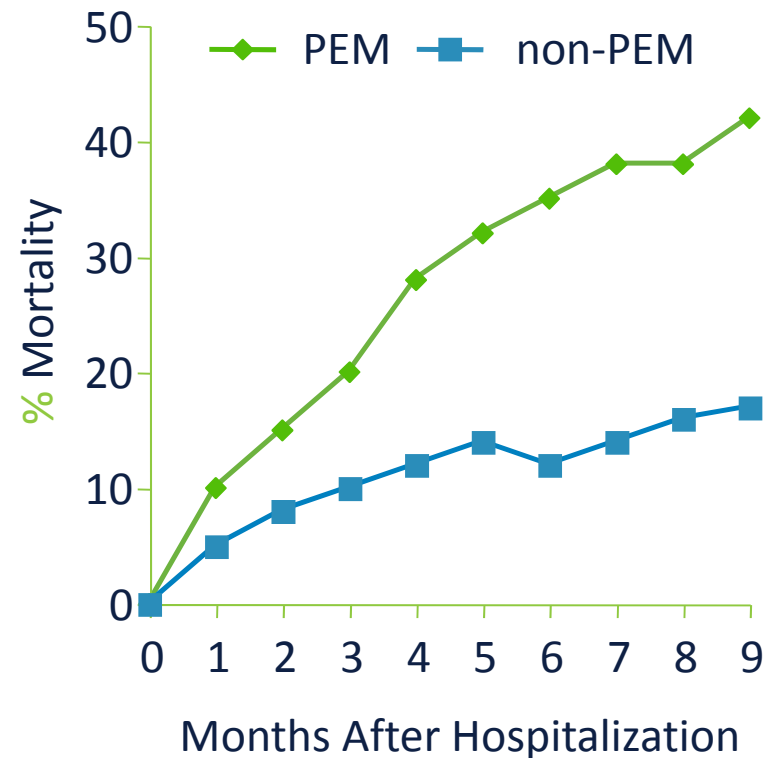


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Increased Mortality

- 44% in malnourished patients vs 18% in well-nourished patients



Cederholm T et al. *Am J Med.* 1995;98:67-74.



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Malnutrition is Associated with Increased LOS

Studies	n	Discipline	Length of Stay (day)		p<
			No- Malnutrition	Yes	
Weinsier 1979	134	GIM	12	20	0.01
Robinson 1987	100	GIM	9.2	15.6	0.01
Cederholm 1995	205	Geriatrics	18	43	0.01
Naber 1997	155	GIM	12.6	20	0.01
Edington 2000	850	Multi	5.7	8.9	0.01
Correira 2003	9348	Multi	10.1	16.7	0.01
Kyle 2004	652	Multi	5.1	10.2*/25.8**	0.001
Pirlich 2006	1886	Multi	11	15* / 17**	0.001
Weighted mean			9.7	17.2	

Norman et al. Prognostic Impact of Disease related Malnutrition
Clinical Nutrition 2008;27:5-15

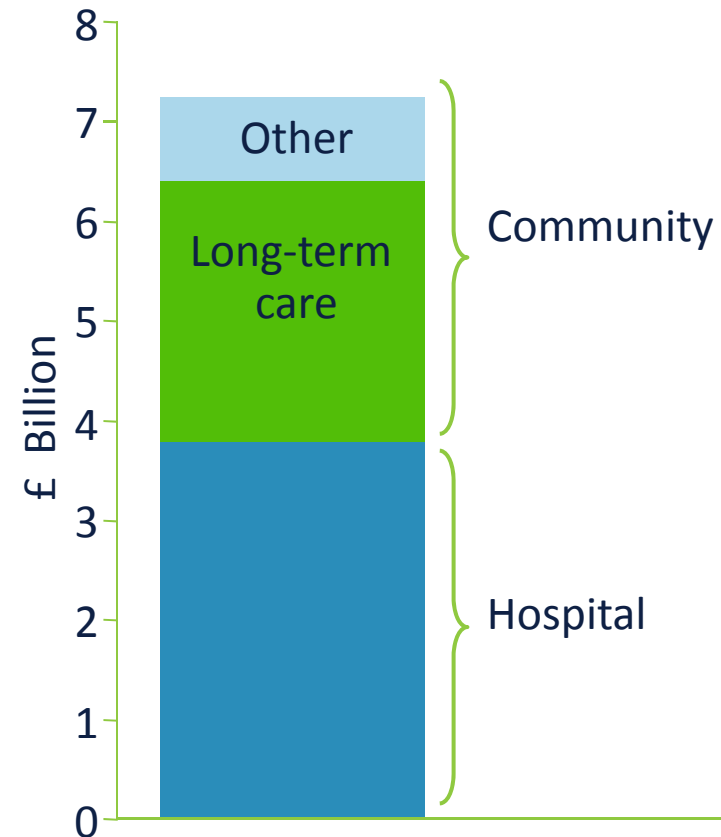


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Higher Healthcare Costs: BAPEN 2005

- Malnutrition in UK costs: excess of £ 7.3 billion per year¹
 - Hospital = £3.8 billion
 - LTC patients = £2.6 billion
 - GP visits = £ 0.49 billion
 - Outpatients = £ 0.36 billion
 - PE, EN and ONS = £ 0.15 billion
- Higher proportion of costs on older adults¹
 - £5 billion for persons > 65 years
- UK costs for obesity = £ 3.5 billion per year¹



1. M Elia, R. Stratton, C. Russell, C. Green, F. Pan; BAPEN, 2005.



Decreased Quality of Life and Functioning

- Malnutrition has been associated with decreased quality of life and functional impairment
 - Malnourished patients have poorer function (ADLs) on admission and at 90 days
 - QoL was significantly poorer for those with a total MNA score <24
 - Malnourished patients have lower QoL scores (SF-36) and 7 out of 8 QoL scores were significantly reduced

Suominen M et al. Eur J Clin Nutr 2005; 59: 578-583.

Neumann SA et al. J Hum Nutr Dietet 2005; 18: 129-136.

Norman K et al. World J Gastroenterol 2006; 12: 3380-3385.

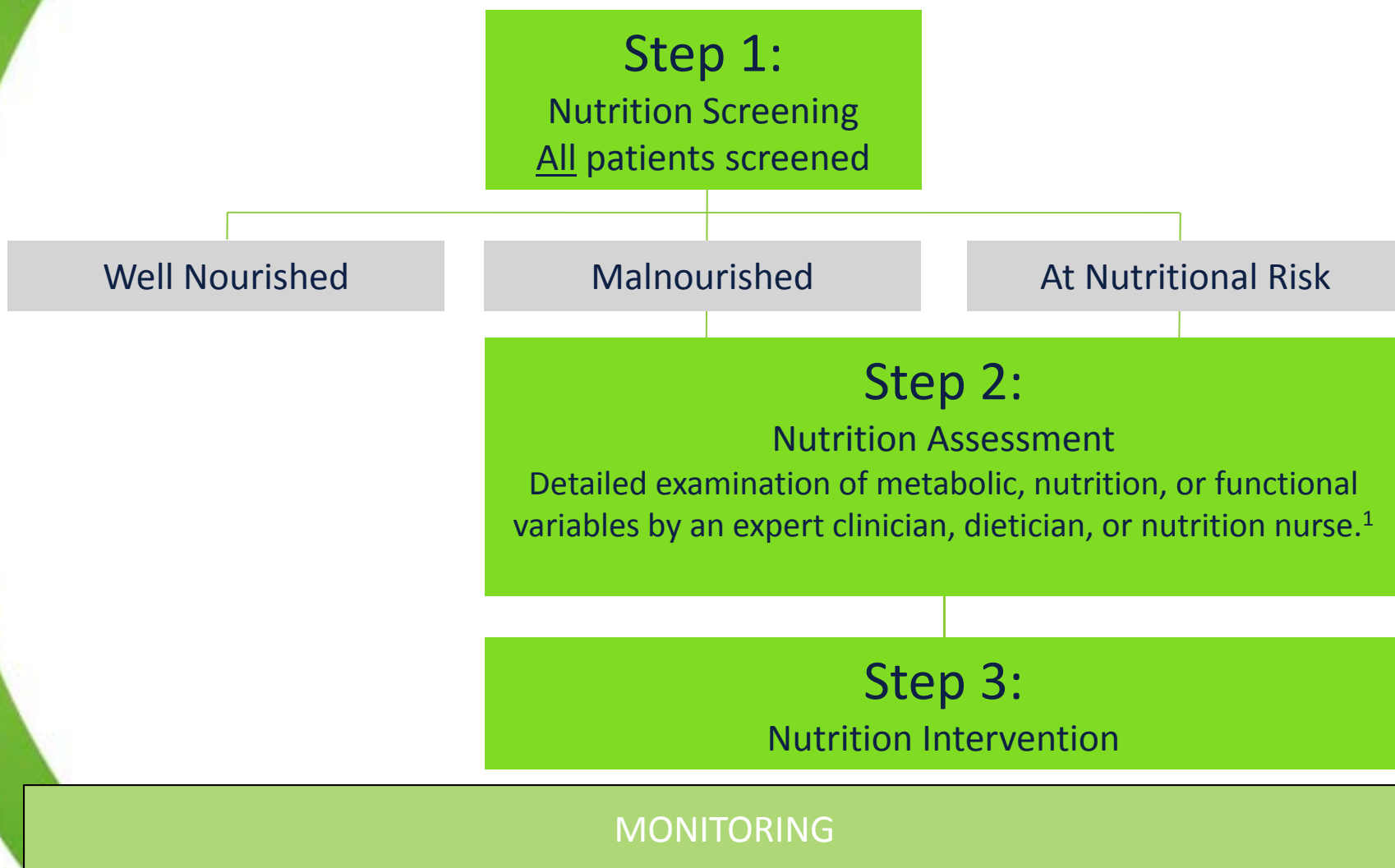
Pauly L et al. Z Gerontol Geriatr 2007; 40: 3-12.



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The Ideal Hospital Care Process: Nutrition Care Pathway



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Step 3: Nutrition Intervention

Potential nutrition intervention strategies:

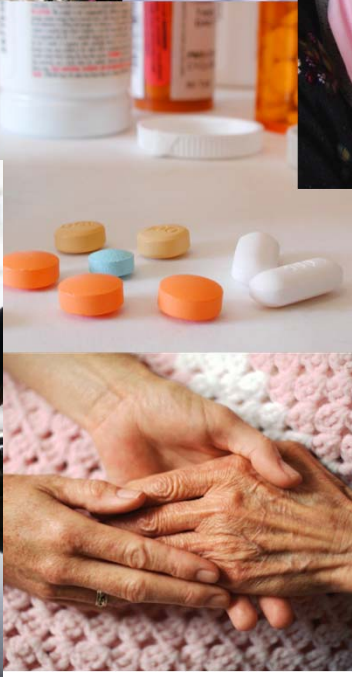
- Alter diet prescription/diet order
- Liberalize diet
- Food fortification
- Provide food/meal preferences
- Recommend vitamin/mineral supplement
- Oral Nutritional Supplements
- Enteral Nutrition
- Parenteral Nutrition



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Pan-Canadian prevalence of hospital malnutrition? How is the nutrition care? How does it affect our patient outcomes?



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CMTF Adult Protocol

- Prospective cohort study
 - Patients followed during hospitalization
 - +30 days post-discharge
- Patient population: adults
 - Consecutive admissions
 - Hospital stay >2 days
 - Surgical and medical wards
- Exclusion: pediatric, obstetric, psychiatry, palliative, admitted directly to ICU
- Academic/community/small and large centers; 8 provinces
- Sample size: 1000 + patients, 18 hospitals
 - Data to date n=1022, 18 hospitals
 - 639 patient mealtime satisfaction surveys
 - 380 Physician surveys (14 sites)
 - 214 nurse surveys (7 sites- phase 2 +)



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Patients' Demography

Parameter		Median (range) or % of Patients
N		1022
Age (years)		66 (18-98)
Gender %	Male	51.91
Ethnicity%	Canadian	81.78
	European	11.46
	Asian ^a	2.36
	Aboriginal/Natives	1.96
Education	High school	38.28
	Post Secondary	40.45

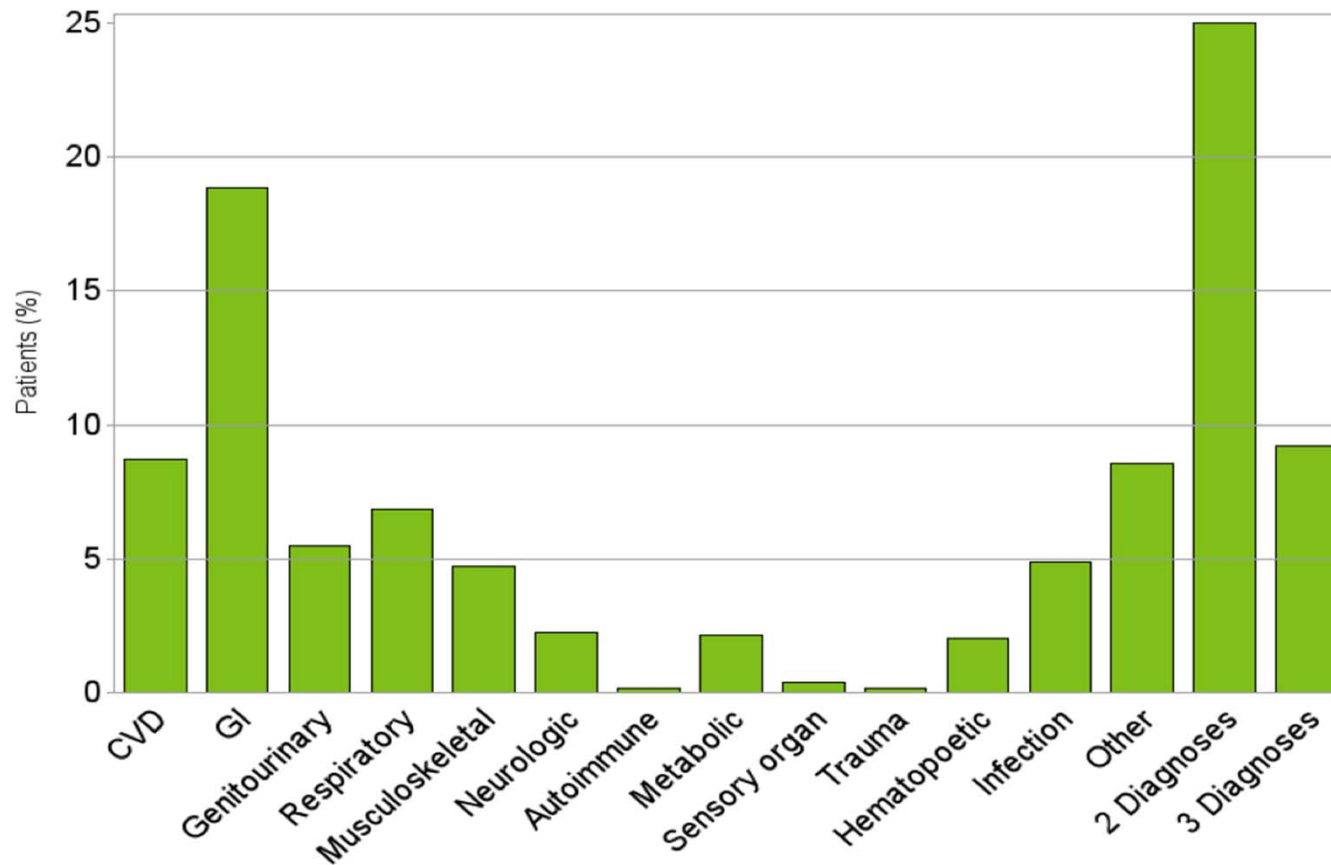
^aSouth Asian, West Asian, East/South East Asian.



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Primary Admitting Diagnosis



Presence of Cancer on Admission 17.26%



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Admission Parameters

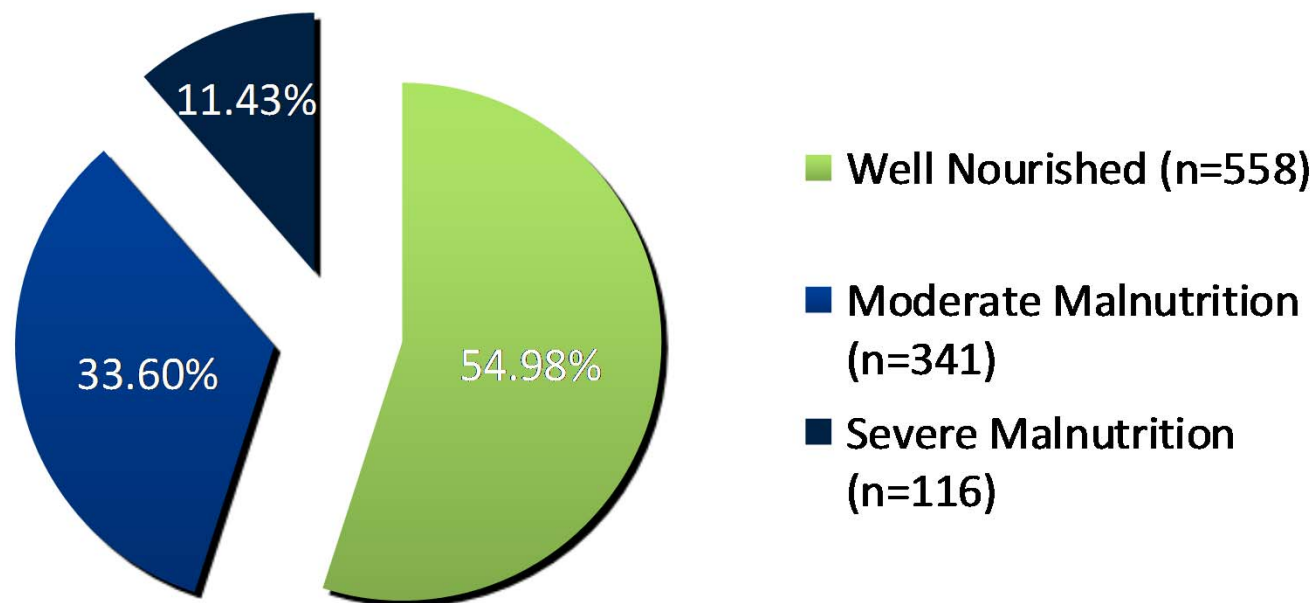
Admission Parameter	N	Median (Range) / %
Charlson Co-Morbidity Index	1005	2 (0; 17)
Number of Medication	1016	10.0 (0; 37)
Number of Supplements (Multivitamins, Minerals)	1015	0 (0; 10)
Oral meal replacement/supplement	1015	21.2%
Antibiotic on admission	1012	42.1%



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Prevalence of Malnutrition at Admission Based on SGA



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Types of malnutrition at admission (n=369 SGA B/C with CRP)

Type of Malnutrition	% (n) of patients
Starvation-related malnutrition (SGA B or C, CRP < 10mg/L)	23.58 (87/369)
Chronic disease-related malnutrition (SGA B or C, CRP ≥10mg/L)	76.42 (282/369)



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Food Intake and Malnutrition

Nutritional Status	< 50% of food intake in week 1	>= 50% of food intake in week 1
Well nourished	25.35%	74.65%
Starvation Malnutrition (SGA B or C and normal CRP)	22.08%	77.92%
Chronic Disease Malnutrition (SGA B or C and elevated CRP)	43.28%	56.72%

31.36% of patients have a low intake in their first week of admission



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Nutritional Parameters: Admission vs Discharge

Parameters	Admission			Discharge			Sign Test	
	N	Range	Median	N	Range	Median	N	P-value
Handgrip Strength (kg)	995	0.0-70.0	20.5	596	0.0-68.0	20.0	587	0.0004
C-Reactive Protein (mg/L)	799	0.16-352.9	29.8	428	0.17-321.8	14.4	385	<.0001
Plasma Albumin (g/L)	904	12.0-78.4	33.0	505	9.0-50.0	32.0	489	0.0770
Weight (kg)	987	31.4-254.7	74.6	677	32.2-190.7	72.9	663	<.0001
Mid arm Circumference (cm)	999	14.2-57.4	30.3	584	14.0-58.3	29.0	578	<.0001
Calf Circumference (cm)	991	18.5-72.2	36.0	582	18.4-70.4	35.5	573	<.0001
BMI (kg/m²)	873	10.8-93.5	26.4	603	11.6-66.1	26.0	565	<.0001



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Other Outcomes

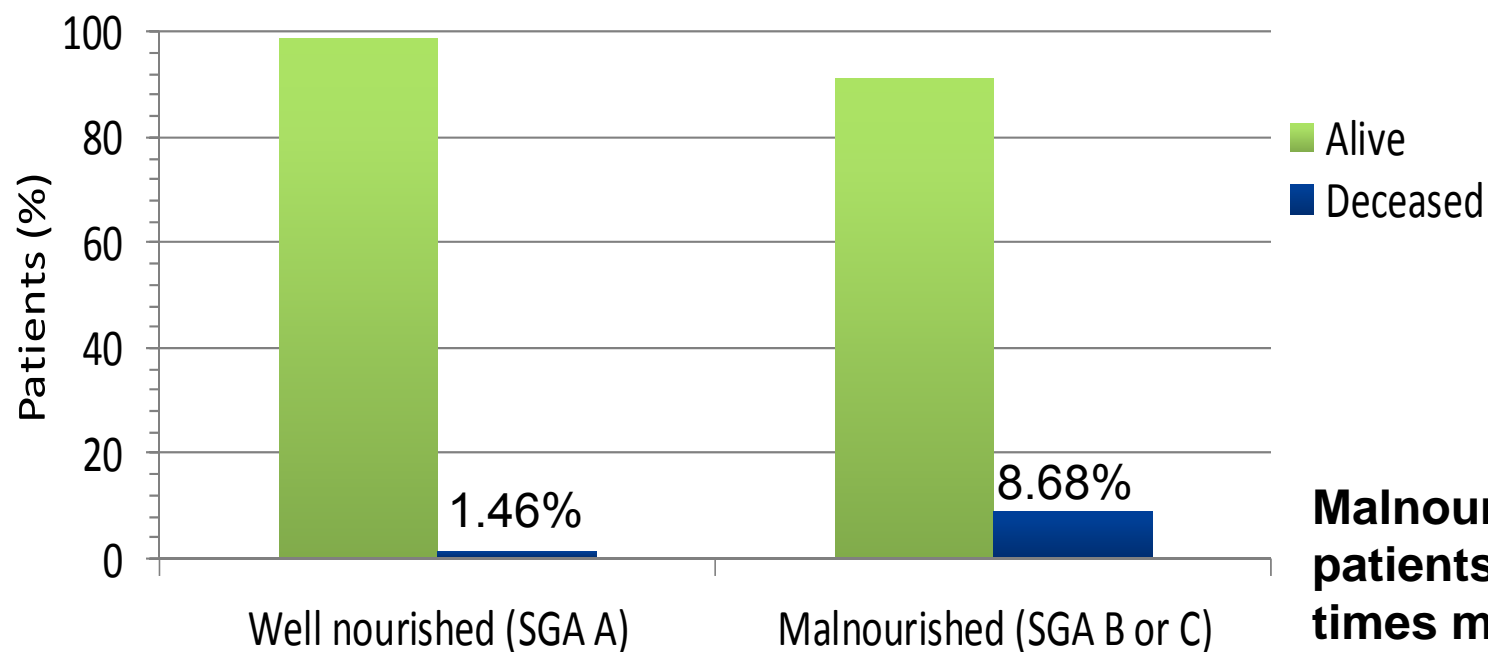
- **Length of stay**
 - **< 7 days = 54.42%**
 - **>= 7 days= 45.58%**
- **Hospital mortality 2.73% (n=27)**
- **30- Day mortality 2.15% (n=20)**
- **30 day readmission 19.76% (n=184)**



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Any Mortality & Nutritional Status



Malnourished patients are 6.4 times more likely to die than well-nourished patients

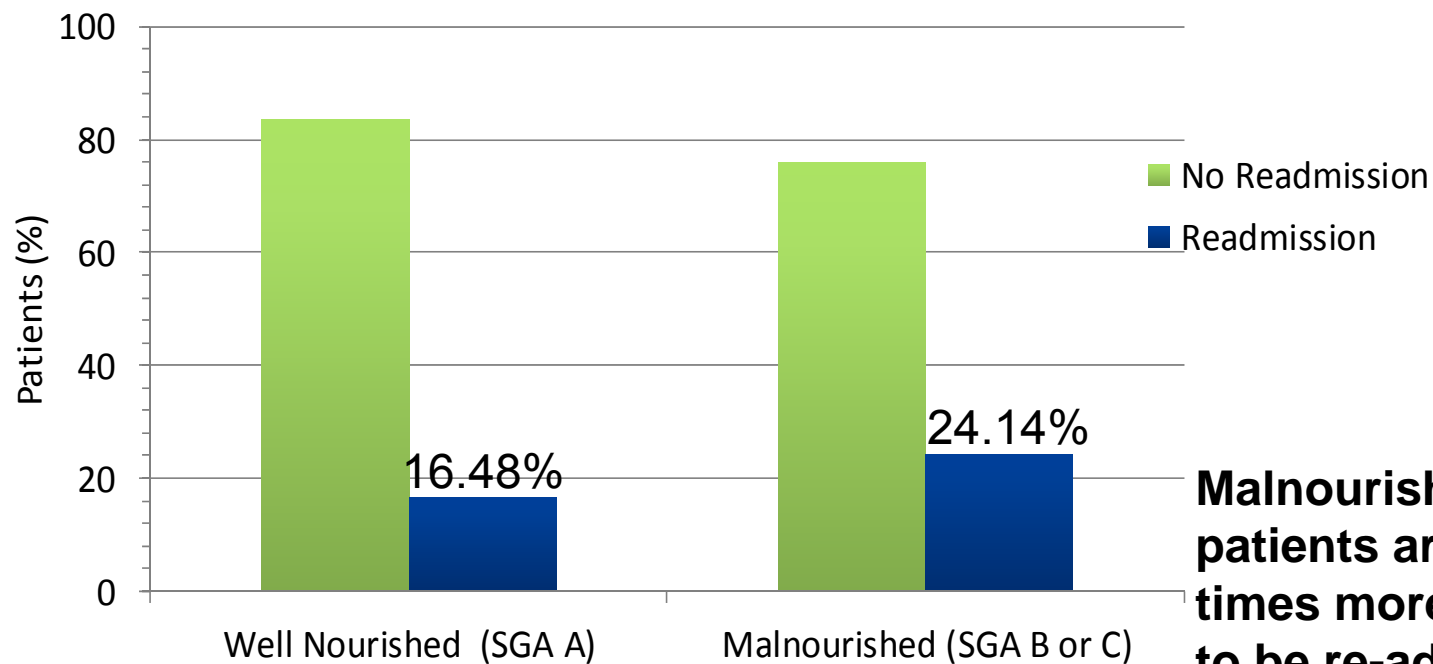
Fisher's Exact test p-value <0.0001
($X^2=28.57$, p-value<0.0001)



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Readmission & Nutritional Status



N = 928

$X^2=8.43$, p-value=0.004

Malnourished patients are 1.61 times more likely to be re-admitted than well-nourished patients



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Protective Factors Associated with Earlier Discharge

Cox Regression

Parameter	Parameter Estimate	p-value	Hazard Ratio (Relative Risk)	95% Hazard Ratio (Relative Risk) Confidence Limits	
Gender (female)	0.105	0.1298	1.11	0.97	1.27
Cancer (not present)	-0.117	0.2512	0.89	0.73	1.09
Age (< 60 y)	0.228	0.0019	1.26	1.09	1.45
CCI (< 3)	0.214	0.0062	1.24	1.06	1.44
Food intake (>50%)	0.162	0.0226	1.18	1.02	1.35
Well nourished	0.225	0.0012	1.25	1.09	1.44

-2 log likelihood = 10175.416

Likelihood Ration Test Chi-Square=39.62 p-value <0.0001

Overall Wald test of Global Null Hypothesis all Beta=0: Wald statistic=39.2214, p-value <0.0001 (Omnibus test of Model Coefficients)



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Predictors of Mortality

(n=47 deaths)

Parameter	Wald Statistic	Odd's Ratio [Exp (B)]	95% CI	P value
Age < 60 vs >=60	7.99	4.57	1.59, 13.1	0.005
CCI <3 vs >=3	5.7	2.2	1.15, 4.35	0.02
SGA A vs B/C	17.6	5.3	2.45, 11.7	<0.0001

All covariates significant predictors in bivariate analysis
Omnibus Tests of Model Coefficients chi-square= 36.7,
df=3, $p<0.0001$;
Hosmer & Lemeshow Chi-square= 1.37 $p=0.97$



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Patient Food Access

- Adapted from Naithani et al., 2009
- Sensory satisfaction, portion size, timing of meals
- Challenges with eating
- Pencil/paper form, majority self-complete
- **N=887 at discharge**
- **89% response rate**

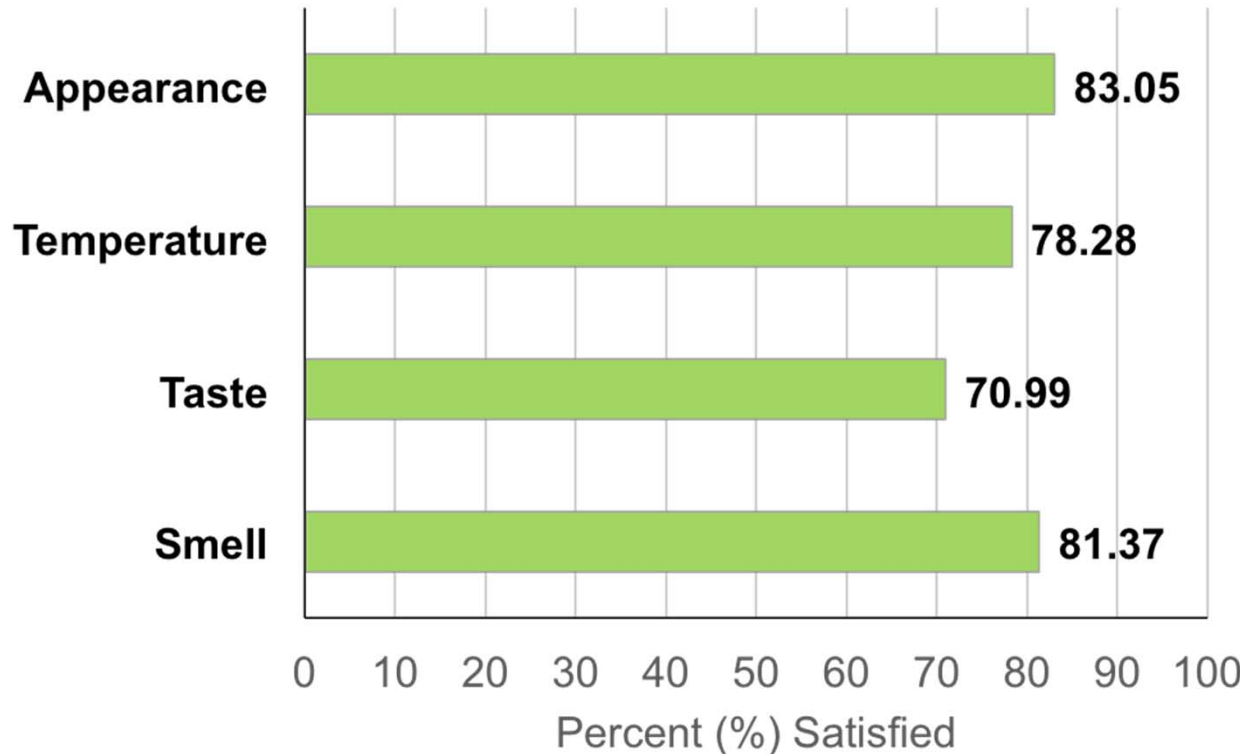


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Patient Satisfaction

Percentage of respondents satisfied with:



13.1%

rated portion size too small

14.1%

rated portion size too large

19.6% rated the
temperature of the food
as too cold

81% satisfied with portion size



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Patient Difficulties with Eating



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Physician Surveys

- N= 428; 35.1% response; 61% male, 75% academic centre
- Adapted Mowe et al., Clin Nutr 2006;25:524-32
- Although 33.1% report >50% of patients receive nutritional assessment on admission; 86.8% believe this should occur
- Protocols for identification of malnutrition reported by 32.1%
- Nutrition knowledge lags behind interest and perceived importance of nutrition



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Nurse Surveys

- N=346, 48% response rate (11 hospitals)
- 90% female, 80% ward nurses, 56% academic hospital
- 55% felt that malnutrition was not a problem on their ward (<25% malnourished)
- 93.5% believed nutrition assessment should occur on admission; 91% felt that 3 nutrition questions could be part of their assessment
- 56% felt dietitian should do screening; 23% nurse



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Best Practice Nutrition Care Process

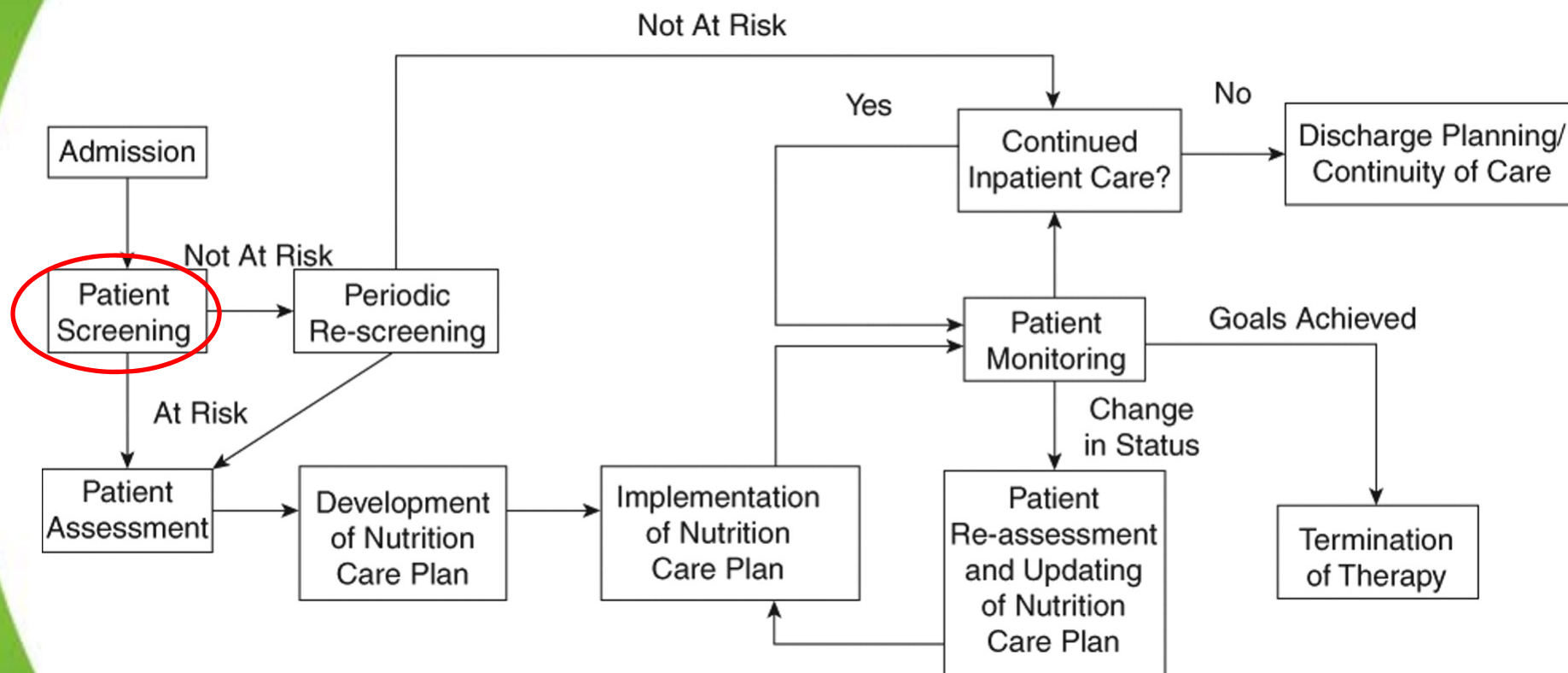


Figure 1. Nutrition care algorithm (adapted from Standards for Specialized Nutrition Support: Adult Hospitalized Patients⁶⁰).



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Summary of Results

- Prevalence of malnutrition ~ 45%
- Disease-related malnutrition more prevalent
- Nutritional status deteriorates in hospital for some
- Food intake < 50% and malnutrition are independent predictors of malnutrition
- Food intake in hospital an important marker of risk and recovery; many factors influence
- Malnutrition results in inefficiency, as 1/5 return to hospital



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Long-term Goals of Study

What we have learned:

- National-level data on malnutrition prevalence and predictors of in-hospital malnutrition;
- How readily we respond to and improve malnutrition
- Patient satisfaction/perceptions;
- Processes that are barriers and those that promote best nutrition practice
- A better understanding of how to achieve nutritional care goals.



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CMTF KT Priorities

- Standardized screening is mandatory in acute care hospitals
- Administrators and health teams are educated on the need to integrate nutrition care into medical practice
- Mealtimes are patient focused; protected, care consistent with nutrition care plan
- Food and nutrition services are optimized to provide quality, appropriate (e.g. culturally, texture) food with adequate nutrients for recovery
- Multidisciplinary team is involved in nutrition care and roles are delineated; RD determines nutrition care plan, including route;
- Nutrition therapies, including oral nutrition supplementation, enteral and parenteral nutrition are used effectively



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Conclusions: Mind the GAP

- Malnutrition is common in hospitalized Canadian patients and contributes to mortality and morbidity
- Factors before admission, at admission and during hospitalization contribute to Malnutrition
- Solutions need to be sought at the system, provider and patient levels to effect change in outcome

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