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

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Provincial Medical Advisor Nutrition Services, AHS
Conflict of Interest

- Speakers Bureau – Abbott Canada
- Speakers Bureau, Advisory Board – Baxter Canada/Global
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
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.
## Who Is the CMTF?

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johane Allard, MD, FRCPC</td>
<td>Ontario</td>
</tr>
<tr>
<td>Paule Bernier, PDt, MSc</td>
<td>Quebec</td>
</tr>
<tr>
<td>Donald R. Duerksen, MD, FRCPC</td>
<td>Manitoba</td>
</tr>
<tr>
<td>Leah Gramlich, MD, FRCPC</td>
<td>Alberta</td>
</tr>
<tr>
<td>Khursheed Jeejeebhoy, MBBS, PhD, MRCP, FRCP</td>
<td>Ontario</td>
</tr>
<tr>
<td>Heather Keller, RD, PhD, FDC</td>
<td>Ontario</td>
</tr>
<tr>
<td>Manon Laporte, RD, MSc, CNSC</td>
<td>New-Brunswick</td>
</tr>
<tr>
<td>Hélène Payette, PhD</td>
<td>Quebec</td>
</tr>
</tbody>
</table>

## Support

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
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<tbody>
<tr>
<td>Bridget Davidson, RD, MSc</td>
<td>National Study Coordinator</td>
<td></td>
</tr>
<tr>
<td>Elisabeth Vesnauer, PhDc</td>
<td>Statistics</td>
<td></td>
</tr>
<tr>
<td>Bianca Arendt, PhD</td>
<td></td>
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</tr>
</tbody>
</table>
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

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Adult Starvation and Disease-Related Malnutrition (Jensen et al., 2010)

- Inadequate nutrients and/or energy
  - No inflammation
    - Undernutrition e.g. prolonged poor intake
    - Chronic e.g. sarcopenia, COPD, Hemodialysis
  - Inflammation
    - Acute e.g. critical illness trauma
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

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**TABLE I.**

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

<table>
<thead>
<tr>
<th>Admission site</th>
<th>Moderate or severe SGA</th>
<th>Country</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute hospital (CRI admission)¹</td>
<td>28% (severe)</td>
<td>Australia</td>
<td>2001</td>
</tr>
<tr>
<td>Acute hospital (n = 2)²</td>
<td>36% (severe)</td>
<td>Australia</td>
<td>1997</td>
</tr>
<tr>
<td>Acute hospital³</td>
<td>45% (severe)</td>
<td>Netherlands</td>
<td>1997</td>
</tr>
<tr>
<td>Acute geriatric hospital⁴</td>
<td>41%</td>
<td>USA</td>
<td>1999</td>
</tr>
<tr>
<td>Acute hospital (n = 13)</td>
<td>50%</td>
<td>Latin America</td>
<td>2001</td>
</tr>
<tr>
<td>Acute hospital⁵</td>
<td>53%</td>
<td>Sweden</td>
<td>1996</td>
</tr>
<tr>
<td>Acute hospital⁶</td>
<td>61%</td>
<td>Switzerland</td>
<td>2002</td>
</tr>
<tr>
<td>Acute hospital (dialysis)⁷</td>
<td>65%</td>
<td>United Kingdom</td>
<td>1997</td>
</tr>
<tr>
<td>Acute geriatric hospital⁸</td>
<td>69%</td>
<td>Sweden</td>
<td>2002</td>
</tr>
<tr>
<td>Geriatric long-term care⁹</td>
<td>70%</td>
<td>USA</td>
<td>2000</td>
</tr>
<tr>
<td>Oncology¹⁰</td>
<td>76%</td>
<td>Australia</td>
<td>2002</td>
</tr>
</tbody>
</table>

* 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

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Malnutrition

- Morbidity $\uparrow$
- Wound healing $\downarrow$
- Infections $\uparrow$
- Complications $\uparrow$
- Convalescence $\downarrow$

- Mortality $\uparrow$
- Treatment $\uparrow$
- LOS $\uparrow$
- QOL $\downarrow$
- COSTS $\uparrow$
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%)

Increased Mortality

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

### Malnutrition is Associated with Increased LOS

<table>
<thead>
<tr>
<th>Studies</th>
<th>n</th>
<th>Discipline</th>
<th>Length of Stay (day)</th>
<th>p&lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>No- Malnutrition</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weinsier 1979</td>
<td>134</td>
<td>GIM</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Robinson 1987</td>
<td>100</td>
<td>GIM</td>
<td>9.2</td>
<td>15.6</td>
</tr>
<tr>
<td>Cederholm 1995</td>
<td>205</td>
<td>Geriatrics</td>
<td>18</td>
<td>43</td>
</tr>
<tr>
<td>Naber 1997</td>
<td>155</td>
<td>GIM</td>
<td>12.6</td>
<td>20</td>
</tr>
<tr>
<td>Edington 2000</td>
<td>850</td>
<td>Multi</td>
<td>5.7</td>
<td>8.9</td>
</tr>
<tr>
<td>Correira 2003</td>
<td>9348</td>
<td>Multi</td>
<td>10.1</td>
<td>16.7</td>
</tr>
<tr>
<td>Kyle 2004</td>
<td>652</td>
<td>Multi</td>
<td>5.1</td>
<td>10.2*/25.8**</td>
</tr>
<tr>
<td>Pirlich 2006</td>
<td>1886</td>
<td>Multi</td>
<td>11</td>
<td>15*/17**</td>
</tr>
</tbody>
</table>

**Weighted mean**

- Length of Stay: 9.7 days
- Weighted mean LOS: 17.2 days

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

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

The Ideal Hospital Care Process: Nutrition Care Pathway

**Step 1:** Nutrition Screening
All patients screened

- Well Nourished
- Malnourished
- At Nutritional Risk

**Step 2:** Nutrition Assessment
Detailed examination of metabolic, nutrition, or functional variables by an expert clinician, dietician, or nutrition nurse.

**Step 3:** Nutrition Intervention

MONITORING
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
Pan-Canadian prevalence of hospital malnutrition? How is the nutrition care? How does it affect our patient outcomes?
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 +)
## Patients’ Demography

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

\(^a\)South Asian, West Asian, East/South East Asian.
Primary Admitting Diagnosis

Presence of Cancer on Admission 17.26%
# Admission Parameters

<table>
<thead>
<tr>
<th>Admission Parameter</th>
<th>N</th>
<th>Median (Range) / %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlson Co-Morbidity Index</td>
<td>1005</td>
<td>2 (0; 17)</td>
</tr>
<tr>
<td>Number of Medication</td>
<td>1016</td>
<td>10.0 (0; 37)</td>
</tr>
<tr>
<td>Number of Supplements (Multivitamins, Minerals)</td>
<td>1015</td>
<td>0 (0; 10)</td>
</tr>
<tr>
<td>Oral meal replacement/supplement</td>
<td>1015</td>
<td>21.2%</td>
</tr>
<tr>
<td>Antibiotic on admission</td>
<td>1012</td>
<td>42.1%</td>
</tr>
</tbody>
</table>
Prevalence of Malnutrition at Admission Based on SGA

- Well Nourished (n=558)
- Moderate Malnutrition (n=341)
- Severe Malnutrition (n=116)
Types of malnutrition at admission (n=369 SGA B/C with CRP)

<table>
<thead>
<tr>
<th>Type of Malnutrition</th>
<th>% (n) of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starvation-related malnutrition (SGA B or C, CRP &lt; 10mg/L)</td>
<td>23.58 (87/369)</td>
</tr>
<tr>
<td>Chronic disease-related malnutrition (SGA B or C, CRP ≥10mg/L)</td>
<td>76.42 (282/369)</td>
</tr>
</tbody>
</table>
### Food Intake and Malnutrition

<table>
<thead>
<tr>
<th>Nutritional Status</th>
<th>&lt; 50% of food intake in week 1</th>
<th>&gt;= 50% of food intake in week 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well nourished</td>
<td>25.35%</td>
<td>74.65%</td>
</tr>
<tr>
<td>Starvation Malnutrition (SGA B or C and normal CRP)</td>
<td>22.08%</td>
<td>77.92%</td>
</tr>
<tr>
<td>Chronic Disease Malnutrition (SGA B or C and elevated CRP)</td>
<td>43.28%</td>
<td>56.72%</td>
</tr>
</tbody>
</table>

31.36% of patients have a low intake in their first week of admission
# Nutritional Parameters: Admission vs Discharge

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Admission</th>
<th>Discharge</th>
<th>Sign Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Range</td>
<td>Median</td>
</tr>
<tr>
<td>Handgrip Strength (kg)</td>
<td>995</td>
<td>0.0-70.0</td>
<td>20.5</td>
</tr>
<tr>
<td>C-Reactive Protein (mg/L)</td>
<td>799</td>
<td>0.16-352.9</td>
<td>29.8</td>
</tr>
<tr>
<td>Plasma Albumin (g/L)</td>
<td>904</td>
<td>12.0-78.4</td>
<td>33.0</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>987</td>
<td>31.4-254.7</td>
<td>74.6</td>
</tr>
<tr>
<td>Mid arm Circumference (cm)</td>
<td>999</td>
<td>14.2-57.4</td>
<td>30.3</td>
</tr>
<tr>
<td>Calf Circumference (cm)</td>
<td>991</td>
<td>18.5-72.2</td>
<td>36.0</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>873</td>
<td>10.8-93.5</td>
<td>26.4</td>
</tr>
</tbody>
</table>
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)
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)
Readmission & Nutritional Status

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

N = 928
X^2=8.43, p-value=0.004
### Protective Factors Associated with Earlier Discharge

**Cox Regression**

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

-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)
## Predictors of Mortality

\( n=47 \text{ deaths} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Wald Statistic</th>
<th>Odd’s Ratio [Exp (B)]</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age &lt; 60 vs &gt;=60</td>
<td>7.99</td>
<td>4.57</td>
<td>1.59, 13.1</td>
<td>0.005</td>
</tr>
<tr>
<td>CCI &lt;3 vs &gt;=3</td>
<td>5.7</td>
<td>2.2</td>
<td>1.15, 4.35</td>
<td>0.02</td>
</tr>
<tr>
<td>SGA A vs B/C</td>
<td>17.6</td>
<td>5.3</td>
<td>2.45, 11.7</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

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
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
Patient Satisfaction

Percentage of respondents satisfied with:

- Appearance: 83.05%
- Temperature: 78.28%
- Taste: 70.99%
- Smell: 81.37%

81% satisfied with portion size

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
Patient Difficulties with Eating

- Self-feeding: 8.8%
- Poor position for eating: 27.6%
- Did not get help to eat meals: 7.8%
- Not enough time to eat meals: 7.4%
- Did not get food ordered (every meal): 3.1%
- Opening packages/unwrapping food: 30.2%
- Reaching meals: 19.8%
- Cutting food: 16.3%
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
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
Figure 1. Nutrition care algorithm (adapted from Standards for Specialized Nutrition Support: Adult Hospitalized Patients60).
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
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.
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
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
Through unrestricted educational grants, our sponsors help in the fight against malnutrition.