## Adverse outcomes in healthcare:

**Increased morbidity and mortality.**

**Prolonged hospital length of stay.**

**Higher healthcare costs.**

**Malnutrition** is the **primary cause of immunodeficiency worldwide**, making individuals more susceptible to infections.

Despite the prevalence (estimated between **20% and 50% of hospitalized patients**), the identification of malnutrition is often time-consuming and rarely integrated into daily practice, and its management is frequently overlooked in HCAI reduction strategies(1)

[1] Yeo, K.-J., Kim, I.-H., Kim, Y., et al. *Prevalence of Malnutrition in Hospitalized Patients: A Multicenter Cross-sectional Study*. **Journal of Korean Medical Science**, 33(2), e10, 2018. https://doi.org/10.3346/jkms.2018.33.e10

**Population: 1689 hospitalised patients**

**1091 eligible for measurement of nutritional risk (NRS-2002)**

**1024 eligible for measurement of energy intake (110% Harris-Benedict formula)**

# Healthcare-Associated Infections Are Associated with Insufficient Dietary Intake: An Observational Cross-Sectional Study

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# Nutritional risk 30.1%

## Nutritional Risk Screening (NRS 2002)

**Nutritional status**

None ○

Mild ●
- Weight loss > 5 % in 3 months or
- 50 – 75 % of the normal food intake in the last week

Moderate ●●
- Weight loss > 5 % in 2 months or
- BMI 18.5 – 20.5 kg / m² and reduced general conditions or
- 25 – 50 % of the normal food intake in the last week

Severe ●●●
- Weight loss > 5 % in 1 month (>15% in 3 months) or
- BMI < 18.5 kg / m² and reduced general conditions or
- 0 – 25 % of the normal food intake in the last week

**Severity of the disease (stress metabolism)**

None ○

Mild ●

Hip fracture, chronic disease especially with complications, e.g. liver cirrhosis, COPD, diabetes, cancer, chronic hemodialysis

Moderate ●●

e.g. stroke, hematologic malignancy, severe pneumonia, extended abdominal surgery

Severe ●●●

e.g. head traumas, hematopoietic stem cell transplantation, intensive care patients (APACHE-II > 10)

**Advanced age ●**    Age ≥ 70 years

**0 – 2 points**
Repeat screening weekly.

**3 – 7 points**
Patient is at nutritional risk. Nutritional care plan should be set up.

# Prevalence of HCAI 6.8%

Other infections included cardiovascular system infection, eye, ear, nose, throat or mouth infection, reproductive tract infection, and skin and soft tissue infection

| HCAI | |
|---|---|
| Urinary tract infection | 24 (30.4) |
| Lower respiratory tract infection, including pneumonia | 18 (22.8) |
| Surgical site infection | 15 (18.9) |
| Bloodstream infection | 9 (11.4) |
| Other infection types[‡] | 9 (11.4) |
| Gastrointestinal system infection | 3 (3.8) |

Patients with HCAI were more likely identified with decreased energy intake (i.e. ≤ 70% of predicted energy needs)

The proportion of patients at nutritional risk was no significantly different between patients with and without HCAI (35.6% *vs.*29.7%, P = 0.28)

Measured energy intake ≤ 70% of predicted energy needs (odds ratio: 2.26; 95% CI: 1.24 to 4.11, P = 0.008) and moderate severity of the disease (odds ratio: 3.38; 95% CI: 1.49 to 7.68, P = 0.004) were associated with HCAI in the multivariate analysis.

**Measured energy intake ≤ 70% of predicted energy needs is associated with HCAI in hospitalised patients. This suggests that insufficient dietary intake could be a risk factor of HCAI, without excluding reverse causality.**



Energy intake (percentage of needs)
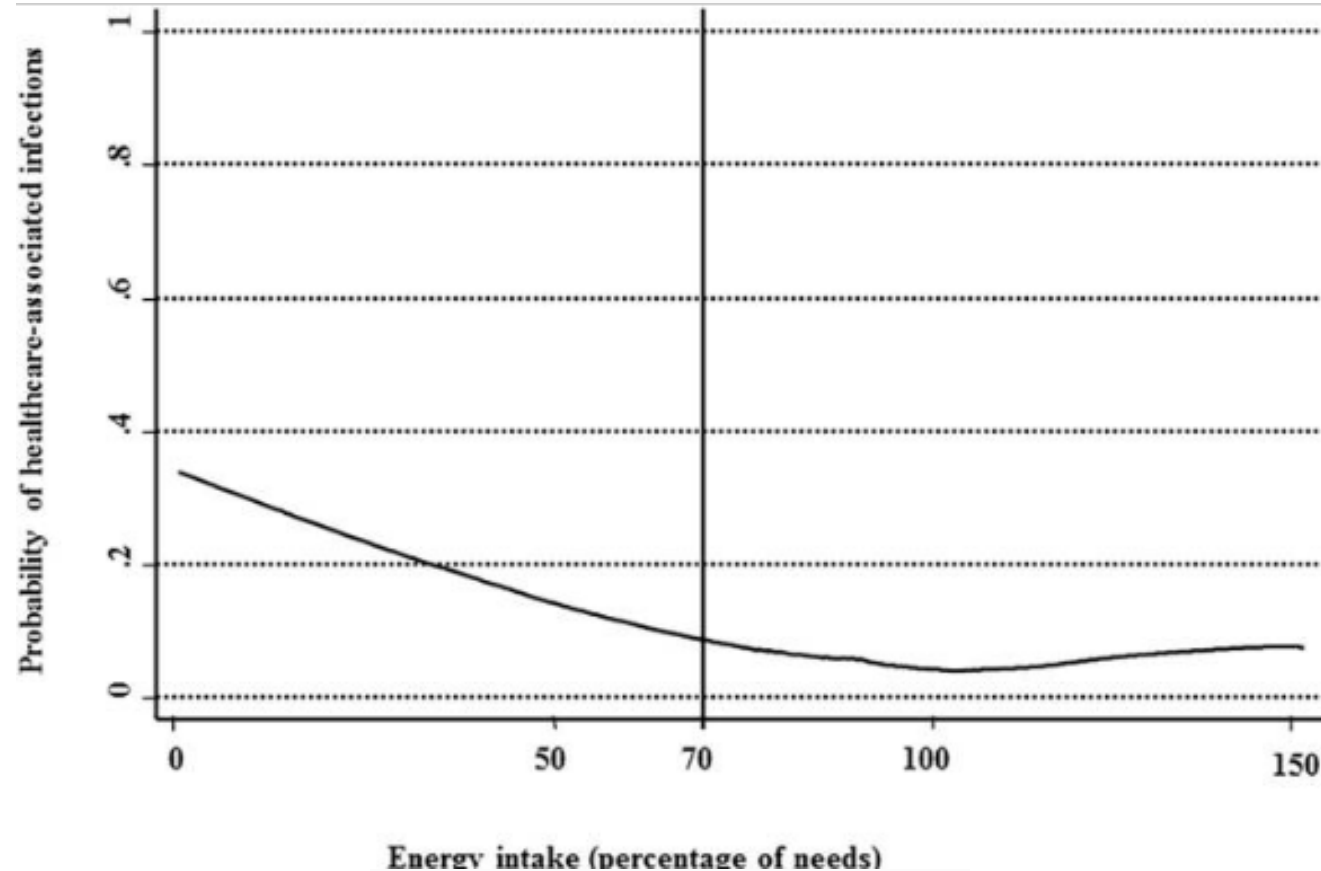
# Food for thought. Malnutrition risk associated with increased risk of healthcare-associated infection

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**Background:**
Infection and malnutrition are interconnected. UK and Irish guidelines recommend the Malnutrition Universal Screening Tool (MUST) for nutritional risk screening. Patients with a MUST score of ≥2 are considered at high risk of malnutrition and referral for nutritional assessment is recommended.

| 1. Body mass index (BMI) (kg/m$^3$) | 2. Unplanned weight loss in past 3–6 months (kg) | 3. Acutely ill plus has been *or* likely no nutritional intake for >5 days |
|---|---|---|
| • >20: score 0 <br> • 18.5–20: score 1 <br> • <18.5: score 2 | • <5%: score 0 <br> • 5–10%: score 1 <br> • >10%: score 2 | If yes: score 2 |

| Add scores from 1 to 3 above to calculate overall malnutrition risk | |
|---|---|
| **Score** | **Action** |
| 0 | Low risk: routine clinical care |
| 1 | Medium risk: observe/document dietary and fluid intake ×3 days |
| ≥2 | High risk: treat, refer for nutritional assessment |

**Population: 240 patients**

**Prevalence of HCAI: 10.4 (N=25)**

**MUST Score >2 (hight risk of malnutrition): 26% (N=63)**

HCAI types included: pneumonia (*N* = 12), surgical site infection (SSI) (*N* = 4), clinical sepsis (*N* = 3), urinary tract infection (UTI), gastrointestinal tract (GI) infection (excluding *Clostridium difficile* infection) (*N* = 2 each category respectively), bloodstream infection (BSI), ear–nose–throat/oral cavity infection and osteomyelitis (*N* = 1 each category respectively)

## Patient demographics, prevalence of malnutrition risk, healthcare-associated infection (HCAI) risk factors and HCAI, and covariates of HCAI

| Variable | Patients with no HCAI (N = 215) | Patients with HCAI (N = 25) | Total (N = 240) | Univariate analysis | | Bivariate analysis | |
|---|---|---|---|---|---|---|---|
| | | | | $x^2$ | P-value | OR (95% CI) | P-value |
| Mean age (years) (range) | 69 (17–97) | 62 (26–93) | 68 (19–97) | | | | |
| Male | 111 (52%) | 16 (64%) | 127 (53%) | 1.4 | 0.24 | | |
| Consultant specialty | | | | | | | |
|   Medical | 151 (70%) | 14 (56%) | 165 (69%) | 2.1 | 0.15 | | |
|   Surgical | 64 (30%) | 11 (44%) | 75 (31%) | | | | |
| MUST ≥2 [a] | 49 (23%) | 14 (56%) | 63 (26%) | 12.8 | <0.001 | 4.3 (1.7–11.2) | <0.001 |
| Surgery since admission | 31 (14%) | 12 (48%) | 43 (18%) | 17.2 | <0.001 | 5.5 (2.1–14.3) | <0.001 |
| End of life or life-limiting prognosis (McCabe score) | 85 (40%) | 14 (56%) | 99 (41%) | 2.5 | 0.11 | | |
| Prescribed antimicrobials [b] | 88 (41%) | 25 (100%) | 113 (47%) | 31.4 | <0.001 | Not calculated | |
| Device(s) present | | | | | | | |
|   Central vascular catheter | 21 (10%) | 13 (52%) | 34 (14%) | 32.9 | <0.001 | 10.0 (3.6–27.2) | <0.001 |
|   Peripheral vascular catheter | 105 (49%) | 15 (60%) | 120 (50%) | 1.1 | 0.29 | | |
|   Urethral catheter | 36 (17%) | 15 (60%) | 51 (21%) | 25 | <0.001 | 7.5 (2.8–20.0) | <0.001 |

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**Patients with HCAI:**

- have had surgery (odds ratio (OR): 5.5; confidence interval (CI): 2.1–14.3; $P < 0.001$)

- a central vascular catheter (OR: 10.0; CI: 3.6–27.2; $P < 0.001$)

- a urinary catheter *in situ* (OR: 7.5; CI: 2.8–20.0; $P < 0.001$).

- High risk of malnutrition (OR: 4.3; CI: 1.7–11.2; $P < 0.001$

# Undernutrition and weight loss have been consistently found to increase mortality risk, at all ages and across care settings

- Integrating nutritional screening, followed by targeted assessment and appropriate nutritional intervention, has clear benefits for patients.

- Addressing malnutrition would also have economic benefits for the healthcare system

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