Older hospitalised patients at risk of malnutrition: correlation with quality of life, aid from the social welfare system and length of stay?

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Abstract

Background: malnutrition is regarded as a major risk factor for complications and delayed recovery in hospitalised elderly patients. Objective: to examine the prevalence of malnutrition in hospitalised elderly patients and evaluate simple clinical screening criteria. To investigate whether malnutrition was related to lack of care from the health care or social welfare system, quality of life and hospital length of stay (LOS).

Setting: non-acute geriatric hospital.

Subjects: 294 elderly patients admitted for rehabilitation after acute hospital care; 244 patients were available for assessment.

Methods: questionnaire interview about nutrition, social network and quality of life. Anthropometric and biochemical measurements, assessment of physical and cognitive function, recording of LOS, discharge destination and diagnosis.

Results: 126 patients (51.6%) were at risk of malnutrition using the criteria of body mass index <22 kg/m² and/or weight loss ≥5%/6 months. Poor quality of life in women (P<0.04) and loss of the health of a spouse (P<0.02) correlated with weight loss. No differences were found in patients at risk regarding LOS, discharge destination, or aid from the social welfare system.
Assessment of nutritional status

Conclusions: this study confirms a high prevalence of malnutrition risk in hospitalised elderly patients. The health care and social welfare system appeared to be unaware of the problem. Poor quality of life in females and loss of the health of a spouse were related to malnutrition risk. The screening variables that were used appeared not to predict hospital length of stay or discharge destination.

Keywords: malnutrition, elderly, hospital care, quality of life, social welfare system

Introduction
Malnutrition, in the sense of undernutrition, arises as the result of an imbalance between the intake and expenditure of energy and nutrients. Disease-related malnutrition (DRM) is frequent in patients with diagnoses leading to reduced appetite or increased energy turnover such as cancer, heart failure, hip fractures, chronic obstructive pulmonary disease and dementia, and in patients with multiple chronic diseases. Damaging major life events, such as illness and the death of a spouse, can lead to a loss of appetite and malnutrition [1]. Studies in Scandinavia and the USA reveal that 3–7% of home-dwelling elderly are malnourished [2–4]. The corresponding figures are higher for elderly hospitalised patients, 8–45% [5–7].

A strong connection has been shown between DRM, increased morbidity and mortality and prolonged hospital care [6, 8–12]. The causality in these connections is still not completely clear.

During the last decade, sub-acute care in Sweden has undergone major changes. Elderly patients are discharged after an average of 6 weeks of hospital care, compared with two or three months in the 1980s. During this shorter hospital stay, malnutrition can be diagnosed, but treatment can only be initiated. To obtain the full effect, the nutritional treatment needs to be continued at home.

The aim of this study was to evaluate whether malnutrition remains a major problem in hospitalised elderly patients in the present structure of the medical services. A further aim was to investigate whether malnutrition was correlated to lack of care from the health care or social welfare system, quality of life and hospital length of stay (LOS).

Subjects and methods

Subjects
This prospective study was conducted on nine geriatric wards at Sahlgrenska University Hospital, Göteborg, during a period of 6 weeks in 1998. Of 329 consecutively admitted patients, 294 were included in the study. The inclusion criterion was informed consent. The exclusion criteria were terminal illness with a life expectancy of a couple of weeks or acute psychiatric disease (five patients). Informed written consent was obtained from all participants.

Weight and height were measured and body mass index (BMI), calculated in 244 subjects, was thus available for nutritional assessment. The dropout group therefore comprised 50 patients in whom weight and/or height were not measured due to patients being bed-ridden or missing data.

The study population consisted of 161 (66%) women, mean age 82.7 years, and 83 (34%) men, mean age 77.6 years. In the dropout group, there were 34 (68%) women, mean age 83.7 years, and 16 (32%) men, mean age 79.8 years. Seven patients (3%) died in hospital in the study group and 6 (12%) in the dropout group.

Approval was given by the Ethics Committee for Medical Research at Göteborg University.

Study design
The attending nurse used a questionnaire with multiple-choice questions, most of which had previously been used in the Swedish longitudinal population studies ‘70-year-old people in Gothenburg’ [13], to assess nutrition-related factors such as weight history, appetite, eating difficulties, food consistency and type of diet, and social welfare factors such as civil status, dwelling conditions, frequency of aid from the social welfare system with personal care, cooking and food purchasing.

Questions about quality of life were asked by the physician or dietician. The subjects reported major life events (LE), recorded in pre-coded categories, which had affected their mood in a positive or negative direction [14–15] during the past year. Positive LE referred to better health (own or spouse), birth of grandchildren and travelling. Negative LE referred to worse health (own or spouse), death of a relative or divorce of children, change of dwelling and miscellaneous events related to either positive or negative LE. The reports on LE, drawn up by the psychologist, are based on interviews with a representative sample of subjects in the population studies of elderly people in Göteborg [16]. One question relating to general psychological well-being was graded from high to low, with an alternative of ‘cannot judge’.

Diagnosis, length of stay, medication, pressure sores, inhospital mortality and placement at discharge were registered from patient charts.

Nutritional assessment
Nutritional status was assessed by anthropometry, weight history and biochemical measurements. Weight and height measurements were made by the care personnel and other anthropometric measurements were made by two dieticians and two research nurses. Weight was measured in the morning with the subjects wearing light clothing and recorded to the nearest 0.1 kg, using a chair scale, mechanical (Lindell) or electronic (Carl Lidén—300 BMI). Standing height was measured to the nearest 0.5 cm using a wall-mounted stadiometer. In immobile patients, height was obtained by questioning. BMI was calculated as weight (kilograms) divided by height (metres) squared. Mid-arm circumference (MAC)
(cm) on the non-dominant arm was measured with a tape measure and triceps skinfold thickness (TSF) (mm), using Harpenden callipers, was measured three times and the mean was registered [17]. Mid-arm muscle circumference (MAMC) was calculated from the formula: MAC − (0.314 × TSF) = MAMC.

At inclusion and at discharge, serum haemoglobin, serum albumin and C-reactive protein (CRP) were analysed using current accredited methods at the Central Laboratory for Clinical Chemistry, Sahlgrenska University Hospital.

Cognitive and physical function

One week after admission to the geriatric ward, the Mini-Mental State Examination (MMSE) [18] was performed by the physicians or the dieticians. At the geriatric ward, physical function was registered by activities of daily living (ADL) according to Katz [19] at admission and discharge by the attending nurse. The Katz ADL index, graded from A to G in a hierarchical order, describes individual performance in terms of hygiene, dressing, mobility, bladder and bowel control and food intake. Katz index ‘A’ stands for independence of assistance, while ‘G’ signifies dependence in all the activities.

Prior to the start of the study, information about how to perform the measurements and use the questionnaire was given to all the investigators. To achieve between-observer agreement, the two dieticians and two research nurses trained together on performing anthropometric measurements and the two physicians and dieticians trained on using the MMSE.

Statistics

Statistical analyses were carried out using SPSS for Windows, version 11.0 (SPSS Inc., Chicago). The analyses that were used were arithmetic means, standard deviation, minimum and maximum values. Differences in proportion were tested with Fisher’s exact test. When adjusting for background factors, binary logistic regression models were used. Differences in means were tested with a $t$-test. When adjusting for background factors, linear regression models or Mantel’s extension [20] were used. All the tests were two-sided. Statistical significance was defined as a $P$ value of $<0.05$.

Results

When comparing the study group and the dropout group, no differences were found in terms of gender, diagnosis, marital status, length of stay, placement at discharge or numbers of drugs at admission. CRP or haemoglobin values did not differ. The 50 dropout patients had a lower s-albumin ($P<0.05$), were more disabled ($P<0.01$) and males were discharged with more drugs ($P<0.05$). At discharge, the dropout group was dependent in three activities of daily living: Katz D compared with Katz C, dependence in two activities, in the study group.

The characteristics of the 244 patients are outlined in Table 1. Women were older than men ($P<0.01$). Women had a significantly lower BMI (1.6 kg/m$^2$) than men ($P<0.01$). When using age as a background factor, the gender difference was no longer significant.

At admission, 106 subjects (43.4%) had a BMI below 22 kg/m. Fifty-nine patients (30.4%) had a recalled loss of weight of $\geq 5\% / 6$ months (Figure 1). Both low BMI and weight loss were present in 39 patients. A weight loss of $\geq 10\%$ occurred in 18% (Figure 1). Forty-five patients (20%) could not recall if their weight had changed. When both a low BMI ($\leq 22$ kg/m$^2$) and/or a weight loss of $\geq 5\%$ were taken into account, 126 patients (51.6%) were classified as being at risk of malnutrition, 74.6% were women. Eight women and 10 men (7.4%) were obese (BMI $\geq 30$ kg/m$^2$). Due to weight loss, two obese women were classified as being at risk of malnutrition. The mean of triceps skinfold thickness (TSF) in women and mid-arm muscle circumference (MAMC) in both sexes was lower in the patients at risk of malnutrition ($P<0.001$. Appetite was reduced ($P<0.001$) in patients at risk (Table 2). The lower the BMI, the poorer the appetite ($P<0.001$).

At admission, the mean of serum albumin ($P<0.02$) and serum haemoglobin ($P<0.001$) was significantly lower in patients at risk of malnutrition (Table 2). Before admission, 114 women (80%) and 33 men (43%) were living alone. The risk of malnutrition was more usual in patients living alone ($P<0.003$). Malnourished patients received more help with personal care ($P<0.05$), according to the questionnaire. At admission or discharge, there was no significant difference when it came to aid from the social welfare system between malnourished and well-nourished subjects (Table 2).

No significant difference was found in total hospital stay between the well-nourished patients and the patients at risk (Table 2). We found no correlation with LOS, not even if sharper criteria were used: a BMI of $<20$ and/or weight loss of $>10\% / 6$ months (data not shown). Most subjects, 72%, were discharged to their own homes, 19% to a nursing home and 3% to an acute-care hospital. There was no significant difference in discharge distribution according to malnutrition.

The two groups did not differ significantly in terms of the number of drugs either at admission or at discharge.

Table 1. Distribution of weight (kg) height (cm), body mass index (kg/m$^2$) and anthropometric measurements of the 244 patients at inclusion

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Mean ± SD</th>
<th>Range</th>
<th>Male</th>
<th>Mean ± SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body height at admission</td>
<td>161.7 ± 6.7</td>
<td>145.0–185.0</td>
<td></td>
<td>175.2 ± 7.2</td>
<td>160.0–193.0</td>
<td></td>
</tr>
<tr>
<td>Body weight at admission</td>
<td>59.2 ± 12.5</td>
<td>31.6–99.0</td>
<td></td>
<td>74.8 ± 15.9</td>
<td>40.5–128.0</td>
<td></td>
</tr>
<tr>
<td>BMI at admission</td>
<td>23.0 ± 4.0</td>
<td>14.0–37.0</td>
<td></td>
<td>24.0 ± 4.0</td>
<td>15.0–37.0</td>
<td></td>
</tr>
<tr>
<td>Habitual weight</td>
<td>62.0 ± 10.8</td>
<td>34.0–89.0</td>
<td></td>
<td>78.0 ± 12.4</td>
<td>44.0–115.0</td>
<td></td>
</tr>
<tr>
<td>TSF (mm)</td>
<td>15.6 ± 6.0</td>
<td></td>
<td></td>
<td>12.5 ± 7.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAMC (cm)</td>
<td>22.5 ± 2.8</td>
<td></td>
<td></td>
<td>24.6 ± 4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>82.7 ± 8.0</td>
<td>59–101</td>
<td></td>
<td>77.6 ± 9.6</td>
<td>55–100</td>
<td></td>
</tr>
</tbody>
</table>
Assessment of nutritional status

Figure 1. Patients at risk of malnutrition according to BMI <22 and weight loss ≥5% 6 months prior to admission.

Table 2. Biochemical, functional and social factors, LOS and number of drugs in well-nourished patients and patients at risk of malnutrition

<table>
<thead>
<tr>
<th>Factor</th>
<th>Well-nourished patients</th>
<th>Patients at risk of malnutrition</th>
<th>n</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum haemoglobin (g/l)</td>
<td>133 ± 18</td>
<td>110</td>
<td>113</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>C-reactive protein (mg/l)</td>
<td>32 ± 48</td>
<td>107</td>
<td>106</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Serum albumin (g/l)</td>
<td>34 ± 5</td>
<td>94</td>
<td>102</td>
<td>P &lt; 0.02</td>
</tr>
<tr>
<td>Low serum albumin &lt;35 (g/l) (%)</td>
<td>44</td>
<td>94</td>
<td>102</td>
<td>P &lt; 0.003</td>
</tr>
<tr>
<td>Katz ADL index (at admission)</td>
<td>D(3.8 ± 2.0)</td>
<td>91</td>
<td>100</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Katz ADL index (at discharge)</td>
<td>C(2.8 ± 1.8)</td>
<td>93</td>
<td>97</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>MMSE &lt;24 (%)</td>
<td>43</td>
<td>81</td>
<td>94</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Reduced appetite (%)</td>
<td>23</td>
<td>105</td>
<td>119</td>
<td>P &lt; 0.001</td>
</tr>
<tr>
<td>Aid from social welfare (% at admission)</td>
<td>33</td>
<td>103</td>
<td>117</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Aid several times/day (% at admission)</td>
<td>18</td>
<td>97</td>
<td>118</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Aid from social welfare (% at discharge)</td>
<td>51</td>
<td>84</td>
<td>103</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Living alone (%)</td>
<td>56</td>
<td>101</td>
<td>118</td>
<td>P &lt; 0.003</td>
</tr>
<tr>
<td>Help with personal care before admission (%)</td>
<td>23</td>
<td>100</td>
<td>116</td>
<td>P &lt; 0.05</td>
</tr>
<tr>
<td>Discharge deposition: own home (%)</td>
<td>71</td>
<td>118</td>
<td>129</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Discharge deposition: nursing home (%)</td>
<td>25</td>
<td>118</td>
<td>129</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Discharge deposition: acute hospital (%)</td>
<td>4</td>
<td>118</td>
<td>129</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>LOS in acute clinic (days)</td>
<td>10.8 ± 12.2</td>
<td>108</td>
<td>112</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>LOS in geriatric clinic (days)</td>
<td>24.7 ± 17.5</td>
<td>108</td>
<td>112</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Number of drugs (at admission)</td>
<td>6.5 ± 3</td>
<td>117</td>
<td>122</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Number of drugs (at discharge)</td>
<td>7 ± 3</td>
<td>102</td>
<td>112</td>
<td>P = n.s.</td>
</tr>
</tbody>
</table>

The health of a spouse was related to the weight loss of the patient (P < 0.02). Poor quality of life correlated with loss of weight in women (P < 0.04).

Discussion

Many variables have been used to assess malnutrition, but a ‘gold standard’ has not yet been defined. One essential variable is weight, related to height, in the form of BMI. A high correlation between the Mini Nutritional Assessment (MNA) score and BMI suggests that BMI can be used as a first screening tool [8]. A large range of cut-off values for BMI (17–23.5 kg/m²) has been used to identify chronic DRM [21]. A BMI of <22 kg/m² was associated with lower 1-year survival in community-dwelling elderly people [22]. Since malnutrition is easier to prevent than treat [5], high indicator sensitivity is valuable. The treatment of sub-clinical malnutrition can prevent the loss of physical and cognitive function [22]. The mean BMI among elderly people, ≥70 years old, in Scandinavia is 26 kg/m² [23]. The ICD-10 uses weight, expressed as standard deviation scores (z scores), to define the probability of malnutrition [21]. In a Swedish reference population [24], a z score of –1 for BMI is approximately 22 kg/m², so we chose to use a BMI of <22 kg/m² as the cut-off value for the risk of malnutrition.

Weight loss is another commonly used variable. Patient-recalled weight should be treated with caution, but it has been frequently used [8, 25–27]. In our study, 20% of the subjects were unable to recall whether weight loss had occurred. Both a low BMI and recent weight loss are important in the evaluation of malnutrition [22, 28–29]. We chose a weight loss of ≤5% during a 6-month period as a warning signal for the development of malnutrition [21]. In

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Table 2: Biochemical, functional and social factors, LOS and number of drugs in well-nourished patients and patients at risk of malnutrition

- **BMI < 22**: 67 patients
- **Weight loss ≥ 5%**: 39 patients
- **Total**: 106 patients

**Lossof appetite (%)**: 23 (105), 51 (108)

**Patients living alone (%)**: 56 (101), 76 (108)

**MMSE <24 (%)**: 43 (81), 43 (84)

**Reduced appetite (%)**: 23 (105), 51 (108)

**Aid from social welfare (% at admission)**: 33 (103), 35 (108)

**Aid several times/day (% at admission)**: 18 (97), 23 (116)

**Aid from social welfare (% at discharge)**: 51 (84), 62 (103)

**Living alone (%)**: 56 (101), 76 (108)

**Help with personal care before admission (%)**: 23 (100), 38 (108)

**Discharge deposition: own home (%)**: 71 (118), 82 (129)

**Discharge deposition: nursing home (%)**: 25 (118), 16 (129)

**Discharge deposition: acute hospital (%)**: 4 (118), 2 (129)

**LOS in acute clinic (days)**: 10.8 ± 12.2 (108), 10.3 ± 8.9 (112)

**LOS in geriatric clinic (days)**: 24.7 ± 17.5 (108), 21.3 ± 12.8 (112)

**Number of drugs (at discharge)**: 6.5 ± 3 (117), 6.3 ± 2 (122)

**Number of drugs (at admission)**: 7 ± 3 (102), 7 ± 3 (112)

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1. Katz D: dependence in two activities.
2. Katz C: dependence in three activities.
3. Cognitive impairment defined as <24 points in Mini-Mental State Examination.
4. Reduced appetite defined as <24 in MMSE was found in 75 patients (44%) and no significant difference was found between well-nourished patients and patients at risk (Table 2).
5. Autonomy measured using the Katz ADL index did not differ between the groups either at admission or at discharge. Cognitive impairment defined as a score of <24 in MMSE was found in 75 patients (44%) and no significant difference was found between well-nourished patients and patients at risk (Table 2).
6. In patients with fractures, cardiovascular diseases, chronic obstructive pulmonary disease, malignancy, infectious diseases, depression and Parkinson’s disease, the malnutrition frequency varied between 50 and 83%. The patients with stroke were more well nourished at admission (P < 0.002), while 30% were at risk of malnutrition. Patients with endocrine disorders, mostly diabetes, and patients with dementia had a lower malnutrition frequency of 39%.
7. Among positive life events, no correlation related to malnutrition was found. Among negative life events, loss of...
western society, low serum albumin usually reflects inflammation and not a lack of nutrients [7]. Anthropometric measurements, TSF and MAMC, reflect body composition and the malnourished patients had significantly lower values in this trial.

In this study, the prevalence of the risk of malnutrition was 51.6%. It is unlikely that we overestimated the risk. Incomplete data were more frequent in patients who were more ill, indicated by lower s-albumin, had a higher degree of disability, and males having more drugs at discharge in the dropout group than in the study group. In a recent Swedish study, the risk of DRM in elderly patients was 43 and 53% respectively using the Subjective Global Assessment and MNA respectively [29].

Malnutrition is often associated with prolonged LOS [8, 12, 28], due to complications that obstruct the rehabilitation process. Thomas et al. [8] found a clear-cut difference in LOS between the malnourished and the at-risk group using MNA but no difference in LOS when only BMI was used.

Nutritional neglect during hospital care, with no systematic screening for malnutrition, might affect our results. In our study, no extra days were spent in hospital to initiate the treatment of malnutrition. The aim of our geriatric clinic is rehabilitation and the patients at risk were not functionally worse. Patients who cannot be rehabilitated are discharged in spite of malnutrition. Another explanation might be a different elderly population. Many other studies have included patients regardless of functional stage [6]. As our two geriatric hospitals are located separately from the emergency care hospital, we do not treat the patients who are most ill. Terminally ill patients were excluded. Nor do we offer primary treatment to patients with dementia.

Reduced appetite, living alone and help with personal care are factors related to a risk of malnutrition in our study. Assistance from the social welfare system might reduce the risk. Unfortunately, malnutrition does not appear to be considered when home aid is granted, either before admission to hospital or at discharge. Nutritional rehabilitation often requires many months of treatment.

Due to many diagnoses, the numbers of patients in each group are limited. To assume that malnutrition has nothing to do with the course of the disease sounds implausible. So, in spite of a high frequency of malnutrition in malignancy and rheumatoid arthritis, the difference between well-nourished and malnourished patients cannot be statistically secured. We only obtained significance for stroke patients being more well nourished at admission.

The single correlation between the health status of the patient and major life events related to the ill-health of the spouse. It is difficult to explain why poorer psychological well-being only correlated to the loss of weight in women. Women are said to complain more about things that reduce well-being only correlated to the loss of weight in women. It is difficult to explain why poorer psychological well-being only correlated to the loss of weight in women.

Key points
- With the present structure of the medical service in Sweden, the prevalence of malnutrition risk is high in hospitalised elderly patients.
- When assessing malnutrition risk, BMI and weight loss are simple clinical criteria that can be used by the ordinary ward staff.
- Predicting hospital stay outcomes, such as the length of stay and discharge destination, requires more specific assessments related to malnutrition severity.
- The risk of malnutrition correlates with poor quality of life.
- Neither the health care setting nor the social welfare system in our study appeared to have paid attention to malnutrition.

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Conflicts of interest
No conflicts of interest declared.

References
1. Grimby A. Support and counselling ease grief; as shown by intervention among recently bereft widows and widowers in Gothenburg. Lakartidningen 1999; 96: 1838–42.
10. Covinsky KE, Martin GE, Beyth RJ et al. The relationship between clinical assessments of nutritional status and adverse

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