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Published in:
Nutrition

DOI (link to publication from Publisher):
10.1016/j.nut.2021.111554

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Publication date:
2022

Document Version
Publisher's PDF, also known as Version of record

Link to publication from Aalborg University

Citation for published version (APA):
Mikkelsen, S., Geisler, L., & Holst, M. (2022). Malnutrition measured by unintended weight loss among patients in general practice. *Nutrition*, *96*, [111554]. https://doi.org/10.1016/j.nut.2021.111554

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Nutrition 96 (2022) 111554

Contents lists available at ScienceDirect

Nutrition

journal homepage: www.nutritionjrnl.com

Applied nutritional investigation

Malnutrition measured by unintended weight loss among patients in general practice

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ARTICLE INFO

Article History:
Received 29 June 2021
Received in revised form 26 October 2021
Accepted 19 November 2021

Keywords:
Malnutrition
Risk for malnutrition
General practice
Reduced food intake
Unintended weight loss

ABSTRACT

Objective: Disease-related malnutrition should be managed before negative consequences occur. The aim of this study was to investigate the prevalence of unintended weight loss and reduced food intake among patients ≥18 y of age attending a general practice.
Methods: All patients visiting five general practices in Denmark, for 4 d in each place, were invited to participate in this questionnaire-based cross-sectional study. The questionnaire consisted of eight questions including unintended weight loss within the previous 2 mo, reduced food intake within the previous week, and symptoms that affected nutrition. Descriptive statistics, χ^2 tests, and simple and multivariable logistic regression analysis were performed. The study included 1087 patients with an 88.7% response rate.
Results: Unintended weight loss was found in 14.2% and 12.9% had reduced food intake. Of the patients with unintended weight loss, 62.3% also had reduced food intake. Patients 18 to 39 and >80 y of age; underweight patients; and patients visiting general practice for chronic pain, mental discomfort, and suspicion of serious illness had significantly higher odds for unintended weight loss and reduced food intake. Patients with reduced food intake had higher odds for unintended weight loss, and those visiting the general practice due to fatigue had higher odds for reduced food intake. Patients in obesity class 1 to 3 and patients who had come for a general health checkup had lower odds. Patients visiting for follow-up on chronic physical illness had higher odds of having unintended weight loss and reduced food intake combined.
Conclusion: Overall, 14.2% of the patients had unintended weight loss, 12.9% had reduced food intake, and 62.3% had both, indicating a high prevalence of unintended weight loss among patients in general practice. Unintended weight loss seems relevant and feasible to use as an initial indicator for the need for further nutritional screening in general practice. Studies are needed to investigate the effect of interventions and outcomes.
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Introduction

Malnutrition is often observed in association with underlying disease and its treatment [1], with increased metabolism and affected ability to eat due to nausea, pain, lack of appetite, and early satiety [2–8]. Malnutrition is associated with increased negative consequences for the individual: longer hospitalizations and rehabilitation, depression, reduced quality of life, reduced physical ability, risk for complications, increased mortality, and poorer response to treatment [1,7,9–16]. Additionally, there are economic consequences associated with malnutrition [7,12,13,17]. A study from the United Kingdom found an increased use of health resources in malnourished patients e.g., twice as many consultations in general practice, three times more hospitalizations, and longer hospital length of stay (LOS) compared with well-nourished patients [17]. Unintended weight loss (UWL) is included in all validated nutrition screening tools and is a significant predictor of malnutrition [18–22]. For instance, even a low weight loss percentage together with low body mass index (BMI) was related to LOS and shorter survival in patients with cancer [23]. Inflammation, as well as insufficient food intake are the primary reasons for disease-related malnutrition [19]. Optimization of individual protein and energy intake in patients and people at risk for disease-related malnutrition can improve clinical outcomes and reduce the negative consequences for patients and society [15,24–26]. Although nutrition intake is closely related to weight loss, not all

This work was supported by Helsefonden (The Health Fund; grant no. 20-A-0062) and the Aalborg University Hospital Nutrition Fund (JOS 10.06.2020). The authors have no conflicts of interest to declare.
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https://doi.org/10.1016/j.nut.2021.111554
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screening tools are specific about food intake [27]. In Denmark, the Nutrition Risk Screening 2002 is recommended for nutrition screening in all hospitalized patients. In addition to determining whether BMI is <20.5 kg/m^2, has the patient experienced weight loss within the previous 3 mo, and is the patient severely ill, the initial screening begins with a question about whether the patient has had a reduced dietary intake within the previous week [28].

The prevalence of malnutrition has been studied over the years in inpatients, and it is recommended inpatients be screened for malnutrition within 24 to 48 h of hospitalization [1]. The prevalence of malnutrition in outpatients was examined in 2019 at Aalborg University Hospital, and the prevalence of UWL was 25.6% [3–5]. Knowledge of the prevalence of malnutrition in general practice is sparse. Studies have found that 15% to 32% of adult patients in general practice were at nutritional risk [29–32], whereas 3% to 12% were malnourished in general practice [29–31,33,34]. The prevalence of malnutrition among the elderly was investigated in Denmark, and the study found that 17% consecutively selected people ≥70 y of age had an UWL [8]. A pilot study in Austria used various screening tools to investigate malnutrition in elderly in general practice and found that 15% to 20% were malnourished [35].

According to the National Board of Social Services and the Danish Health Authority, general practice must be aware of any UWL in in elderly patients. This included weight loss down to 1 kg [36–38]. It is widely acknowledged that this recommendation is not implemented, and that full nutritional screening is unachievable in all patients in general practice.

Early identification of malnutrition risk is the starting point for timely action against malnutrition and prevention of negative nutrition-related consequences. In patients with cancer, the negative consequences (e.g., mortality) are proportional to the degree of the weight loss [15,20,39]. Studies have shown that weight loss may increase the risk for survival and restoration of lost muscle mass and function in patients with cancer [20,40].

Due to the lack of knowledge about the prevalence of malnutrition risk in general practice in Denmark, and to the lack of implementation of recommendations, the aim of this study was to investigate the prevalence and relevance of UWL within the previous 2 mo and reduced food intake (RFI) within the past week, among patients ≥18 y of age visiting a general practice, as initial indicators for the need for further nutritional screening in general practice.

Material and methods

This was a questionnaire-based cross-sectional study. The questionnaire was developed by the based on a questionnaire used in other studies [3–5]. The questionnaire was tested and validated by general practitioners and nurses from the five included general practices in Denmark. Thus, data were collected over 4 d in each general practice. Risk for malnutrition was measured using UWL and RFI as initial indicators for malnutrition among patients visiting the general practices on the 4 d. UWL within the previous 2 mo was chosen as it is used in other recommendations from the Danish Health Authority [36,41], and RFI <75% of daily intake within the previous week was used [4,28,42,43]. Due to the lack of juxtaposed studies, no sample size was calculated, and thus a pragmatic sample size approach was used.

Settings

Five different general practices were included. All practices had two or more general practitioner, nurses, and secretaries. Additionally, they all had different internal organization. Both city and country locations were represented. In adult patients, typically nurses were engaged with annual investigations and follow-up on chronic diseases, general health examinations, dispensing medications to special groups such as the mentally ill and drug or drug addicts, removal of stitches, taking blood samples, and other specifically delegated tasks.

Questionnaire

The questionnaire consisted of the following eight questions:

1. Sex;
2. Age (y), weight (kg), and height (cm);
3. Is your visit in general practice today to see the general practitioner and/or nurse and/or have blood tests;
4. Reason for visit the general practice today: newly emerged disease and/or new injury and/or follow-up on chronic physical illness e.g., annual checkup and/or chronic pain and/or new-onset pain and/or visits for prescription renewal and/or virus/flu symptoms and/or mental discomfort e.g., anxiety, depression, or control and/or fatigue and/or suspicion of serious illness and/or skin problems and wounds and/or pregnancy examination and/or general health check and/or medical certificate e.g., driving license and/or vaccination and/or other;
5. UWL within the previous 2 mo (yes or no). If yes, what was the amount of weight loss (kg);
6. RFI within the past week compared with usual (yes or no);
7. Intended weight loss (yes or no). If yes, what was the amount of weight loss (kg).

If yes to question 5 and/or 6, the following question should also be answered:

8. Nutrition impact symptoms (NIS; nausea and/or pain and/or worries and/or swallowing problems and/or lack of appetite and/or constipation and/or lack of help for cooking/shopping and/or do not like eating alone).

Patients could fill in more than one answer to question 3, 4, and 8.

Inclusion and exclusion criteria

Patients ≥18 y of age visiting the general practice who were willing to participate were included in the study. Exclusion criteria included in the following; Patients who did not speak Danish or English or have a relative who speak Danish or English who would help with the questionnaire, parents who were relatives to a child <18 years, patients who were wheelchair user and could not stand on the scales or patients who, for other reasons, i.e., mental impairment and did not seem understand the given oral information.

After patients had checked in for the consultation, they were contacted by the investigators in the waiting room. The patients received oral information, and if they were willing to participate in the study, they were given the printed questionnaire to fill in or they could choose for the investigators to fill it in while sitting or standing next to them. If the patients had not weighed themselves at home on that day, and had their height measured within 1 y, height and weight were measured in a section of the waiting room that was enclosed by screens for the purpose. So, all data were self-reported except if patients had their weight and height measured that day. The patients' previous weight and height were not known. The same weight scale and stadiometer were used for each patient.

Statistics

Data were entered into Research Electronic Data Capture hosted by Aalborg University Hospital, and data entry was double-checked. 999 indicated missing data and were excluded from the subsequent analysis. Data was extracted and analyzed using SAS version 9.4 (SAS Inc., Cary, NC, USA). Missing data were excluded from the association analysis and the logistic regression analysis. Descriptive statistics were drafted and presented as number of filled-in replies (N) and percent (%) or median and range. UWL and RFI were the two dependent variables, whereas the other variables were used as independent variables.

To investigate the association between the dependent and independent variables, χ^2 tests and simple logistic regression analysis were performed. Multivariable logistic regression analysis was performed to investigate the association between both RFI and UWL in relation to RFI, visit today, and reason for visit adjusted for sex, age, BMI, and which general practice, as well as UWL and RFI combined. As the patients could fill in more than one answer to questions 3, 4, and 8, some patients are duplicated. A simple and multivariable logistic regression were performed for each category in questions 3 and 4. A significant level of 0.05 ($P < 0.05$) was used, and odds ratio (OR) with an associated 95% confidence interval (CI) was calculated. The reference group was chosen as the group with the most answers. A limit value of 1 kg was used regarding UWL and intended weight loss [38]. BMI was defined according to the World Health Organization's (WHO) definition of BMI groups [44].

Ethical consideration

Participation was voluntary and no information gathered could lead back to the patient. The regional ethic committee was approached about the study (October 22, 2019) which found no reason for full application due to the Danish legislation.

Validity and reliability

The checklist from Strengthening the Reporting of Observational studies in Epidemiology was used to ensure the validity and reliability of the study's findings [45].

Results

In this study, 1087 patients were included, and 56% were women. Median age was 58 y, ranging from 18 to 94 y. Median BMI was 26.3 kg/m^2 (14.9–59.5 kg/m^2), which means that most participants were overweight according to the WHO definition of BMI [44]. Most data were collected in general practice 1 (37.7%), and the least data was collected in general practice 2 (8.7%). The response rate was 88.7% (n = 138). Reasons for not participating in this study were unwillingness to participate, unwillingness to disclose weight, or wheelchair user. UWL was seen in 14.2% and the median weight loss was 4 kg. Additionally, 12.9% had RFI and 62.3% of patients with UWL also had RFI. Conversely, of patients with RFI, 68.6% had UWL. Intended weight loss was seen in 13.5% patients with a median weight loss of 6.5 kg. Table 1 presents the demographic and descriptive data.

In general practice, most of the patients visited the general practitioner (53.6%) and nurses (47.8%) (Table 2). Some visited both nurse and general practitioner, and/or had blood samples taken by the nurse, which was registered separately. The three most common reasons for visiting the general practice were to follow up on chronic physical illness (31%), general health checkup (15.2%), and new-onset disease (14.2%) (Table 3).

Respectively, 153 and 137 patients had reported NIS in relation to UWL and RFI. The most common NIS were lack of appetite (60.8% and 65%), pain (29.4% and 29.2%), worries (28.1% and 29.9%), and nausea (15.7% and 19.7%). No NIS were reported for 20.3% and 16.1% as associated to UWL and RFI (Table 4).

No association was seen between sex and general practice compared with UWL (P = 0.631 and 0.330, respectively). Patients 18 to 39 and 80 to 99 y of age had higher odds of having UWL compared with patients 60 to 79 y (OR, 1.68; 95% CI, 1.09–2.59 and OR, 2.54; 95% CI, 1.48–4.38, respectively). Median age for patients with UWL was 57.5 y (18–94 y). Underweight patients had higher odds of having UWL compared with those with normal weight (OR, 2.69; 95% CI, 1.17–6.21). Overweight and patients in obesity class 1 to 3 had lower odds of having UWL compared with normal weight (OR, 0.48; 95% CI, 0.32–0.73 and OR, 0.38; 95% CI, 0.23–0.61, respectively). These results are presented in Table 5. Median BMI for patients with UWL was 23.5 kg/m^2 (16.3–36.9 kg/m^2), which means that patients with UWL were overall normal weight according to the WHO definition of BMI [44].

Patients with RFI had higher odds of having UWL (OR, 41.09; 95% CI, 24.96–67.66). Patients who visited the general practitioner had higher odds of having UWL (OR, 1.67; 95% CI, 1.15–2.43), whereas patients who visited the nurses had lower odds of having UWL (OR, 0.61; 95% CI, 0.42–0.88). Patients who visited the general practice for chronic pain, mental discomfort, and suspicion of serious illness had higher odds of having UWL (OR, 3.68; 95% CI, 1.97–6.87; OR, 2.98; 95% CI, 1.47–6.02; and OR, 10.17; 95% CI, 4.63–22.35, respectively). Patients who visited the general practice for general health checkup and vaccination had lower odds of having UWL (OR, 0.26; 95% CI, 0.13–0.55 and OR, 0.19; 95% CI,

Table 1
Demographic data of the patients

Variable	n (%) or median (range)	Total
Women, n (%)	609 (56)	1087
General practice (N = 5), n (%)		1087
General practice 1	410 (37.7)	
General practice 2	94 (8.7)	
General practice 3	220 (20.2)	
General practice 4	116 (10.7)	
General practice 5	247 (22.7)	
BMI (kg/m^2), median (range)	26.3 (14.9–59.5)	1077
Age (y), median (range)	58.0 (18-94)	1082
UWL: yes, n (%)	154 (14.2)	1087
UWL (kg) median (range)	4.0 (1–35)	148
RFI: yes, n (%)	140 (12.9)	1087
RFI in those who had UWL: yes, n (%)	96 (62.3)	154
UWL in those who had RFI: yes, n (%)	96 (68.6)	140
Intended weight loss: yes, n (%)	147 (13.5)	1087
Intended weight loss (kg) median (range)	6.5 (1.5–26)	133

RFI, reduced food intake; UWL, unintended weight loss

Table 2
Reason for visit to general practice*

Reason for visit	Patients (N = 1087), n (%)
To see GP	583 (53.6)
To see nurse	519 (47.8)
Blood test	223 (20.5)
Other	15 (1.4)

GP, general practitioner.
*Patients could fill in more than one answer to this question.

Table 3
Reason for visit to general practice*

Reason for visit	Patients (N = 1087), n (%)
Follow up for chronic illness	337 (31)
Chronic pain	54 (5)
New-onset pain	117 (10.8)
Fatigue	40 (3.7)
Mental discomfort	49 (4.5)
Skin problems and wounds	58 (5.3)
Suspicion of serious illness	30 (2.8)
New injury	63 (5.8)
New-onset disease	154 (14.2)
General health checkup	165 (15.2)
Vaccination	62 (5.7)
Follow up of non-chronic illness	66 (6.1)
Other reasons†	102 (9.4)

*Patients could fill in more than one answer to this question.
†Other reasons: prescription renewal, virus/flu symptoms, pregnancy examination, investigation of familial predisposition to disease, musculoskeletal disorders, follow up of old injury, medical certificate, and reasons unknown.

Table 4
Nutrition impact symptoms*

Nutrition impact symptoms	Unintended weight loss: yes (n = 153), n (%)	Reduced food intake: yes (n = 137), n (%)
Nausea	24 (15.7)	27 (19.7)
Pain	45 (29.4)	40 (29.2)
Worries	43 (28.1)	41 (29.9)
Swallowing problems	3 (2)	3 (2.2)
Lack of appetite	93 (60.8)	89 (65)
Constipation	5 (3.3)	8 (5.8)
Lack of help cooking/shopping	1 (0.7)	1 (0.7)
Does not like eating alone	9 (5.9)	12 (8.8)
More physical activity/Less activity (less muscle mass)	6 (3.9)	3 (2.2)
Medicine	6 (3.9)	4 (2.9)
Unknown causes	31 (20.3)	22 (16.1)

*Patients could fill in more than one answer to this question.

Table 5
Association between unintended weight loss and sex, general practice, age, and BMI

Unintended weight loss (yes) Variable = 1073	OR (95% CI)	*P*-value
Sex		0.631
Women	Reference	
Men	0.92 (0.65–1.30)	
General practice		0.330
General practice 1	Reference	
General practice 2	1.02 (0.53–1.95)	
General practice 3	0.84 (0.50–1.38)	
General practice 4	1.59 (0.93–2.72)	
General practice 5	1.13 (0.72–1.77)	
Age		0.001*
18–39	1.68 (1.09–2.59)*	
40–59	1.00 (0.62–1.62)	
60–79	Reference	
80–99	2.54 (1.48–4.38)*	
BMI†		<0.001*
Underweight	2.69 (1.17–6.21)*	
Normal weight	Reference	
Overweight	0.48 (0.32–0.73)*	
Obesity class 1, 2, and 3	0.38 (0.23– 0.61)*	

BMI, body mass index; UWL, unintended weight loss.
*$P < 0.05$.
†BMI defined according to World Health Organization definition [44].

Table 7
Association between reduced food intake and sex, age, general practice, and BMI

Reduced food intake (yes) Variable = 1073	OR (95% CI)	*P*-value
Sex		0.111
Women	Reference	
Men	0.742 (0.51–1.07)	
General practice		0.158
General practice 1	Reference	
General practice 2	1.08 (0.52–2.25)	
General practice 3	1.65 (1.01–2.70)*	
General practice 4	1.80 (0.10–3.25)	
General practice 5	1.52 (0.93–2.46)	
Age, y		0.024*
18–39	1.68 (1.06–2.66)*	
40–59	1.33 (0.82–2.17)	
60–79	Reference	
80–99	2.29 (1.27–4.12)*	
BMI†		<0.001*
Underweight	3.72 (1.60–8.66)*	
Normal weight	Reference	
Overweight	0.57 (0.36–0.89)*	
Obesity class 1, 2, and 3	0.71 (0.45–1.13)	

BMI, body mass index; RFI, reduced food intake.
*$P < 0.05$
†BMI defined according to World Health Organization definition [44].

0.05–0.81, respectively). These results are presented in Table 6, and are adjusted for sex, age, BMI, and general practice.

There were no associations between sex and general practice compared with RFI ($P = 0.111$ and 0.158, respectively). Patients in general practice at age 18 to 39 y and 80 to 99 y had higher odds of having RFI compared with those in the 60 to 79 y age group (OR, 1.68; 95% CI, 1.06–2.66 and OR=2,29 [1.27;4.12, respectively). Patients who were underweight had higher odds of having RFI compared with those with normal weight (OR, 3.72; 95% CI, 1.60–8.66). Overweight patients had lower odds of having RFI compared with normal weight patients (OR, 0.57; 95% CI, 0.36–0.89). These results are presented in Table 7.

Patients who visited the general practitioner had higher odds of having RFI (OR, 1.69; 95% CI, 1.15–2.49), whereas those who visited the nurses had lower odds of having RFI (OR, 0.61; 95% CI, 0.42–0.90]). Patients who visited the general practice for chronic pain, fatigue, mental discomfort, and suspicion of serious illness had higher odds of having RFI (OR, 3.16; 95% CI, 1.70–5.90; OR, 2.32; 95% CI, 1.09–4.95; OR, 3.62; 95% CI, 1.85–7.08; and OR, 4.22; 95% CI, 1.95–9.14, respectively). Patients who visited the general practice for skin problems and wounds as well as general health check had lower odds of having RFI (OR, 0.23; 95% CI, 0.05–0.94 and OR, 0.43; 95% CI, 0.23–0.83, respectively). These results are presented in Table 8, and are adjusted for sex, age, BMI, and general practice.

Table 6
Association between unintended weight loss and reduced food intake, visit to general practice, and reason for visit

Unintended wiight loss (yes) Variable = 1073	*P*-value	OR (95% CI)	Adjusted OR (95% CI)†
Reduced food intake (yes)	<0.001*	34.23 (21.83-53.68)*	41.09 (24.96–67.66)*
Visit in general practice today			
General practitioner (yes)	0.002*	1.75 (1.22–2.49)*	1.67 (1.15–2.43)*
Nurse (yes)	0.002*	0.57 (0.40–0.82)*	0.61 (0.42–0.88)*
Other (yes)	0.148	—§	—§
Reason for visit			
Follow up of chronic illness (yes)	0.311	1.21 (0.84–1.73)	1.30 (0.88–1.91)
Chronic pain (yes)	<0.001*	3.37 (1.86–6.12)*	3.68 (1.97–6.87)*
New-onset pain (yes)	0.712	1.11 (0.65–1.89)	1.07 (0.62–1.86)
Fatigue (yes)	0.109	1.85 (0.86–3.99)	1.93 (0.87–4.30)
Mental discomfort (yes)	0.002*	2.71 (1.41–5.19)*	2.98 (1.47–6.02)*
Skin problems and wounds (yes)	0.042*	0.32 (0.10–1.02)	0.31 (0.10–1.01)
Suspicion of serious illness (yes)	<0.001*	8.72 (4.14–18.36)*	10.17 (4.63–22.35)*
New injury (yes)	0.753	0.89 (0.41–1.90)	0.77 (0.35–1.68)
New-onset disease (yes)	0.712	1.10 (0.68–1.77)	1.06 (0.65–1.73)
General health checkup (yes)	0.002*	0.27 (0.13–0.57)	0.26 (0.13–0.55)*
Vaccination (yes)	0.011*	0.19 (0.05–0.79)*	0.19 (0.05–0.81)*
Follow up of non-chronic illness (yes)	0.564	1.22 (0.62–2.38)	1.20 (0.60–2.41)
Other reasons‖ (yes)	0.938	0.98 (0.54–1.77)	0.99 (0.54–1.82)

The answers "yes" are presented; the answer "no" is the reference.
*$P < 0.05$.
†Adjusted for gender, age, BMI and general practice.
§Indicates insufficient data to calculate OR.
‖Other reasons: visits for prescription renewal, virus/flu symptoms, pregnancy examination, investigation of familial predisposition to disease, musculoskeletal disorders, follow-up of old injury, medical certificate, and reasons unknown.UWL, unintended weight loss

Table 8
Association between reduced food intake and visit to general practice and reason for visit

Reduced food intake (yes) Variable = 1073	*P*-value	OR (95% CI)	Adjusted OR (95% CI)[†]
Visit to general practice			
General practitioner (yes)	0.003*	1.76 (1.21–2.56)*	1.69 (1.15–2.49)*
Nurse (yes)	0.006*	0.60 (0.41–0.86)*	0.61 (0.42–0.90)*
Other (yes)	0.240	—[§]	—[§]
Reason for visit			
Follow-up on chronic physical illness (yes)	0.642	1.105 (0.75–1.61)	1.21 (0.81–1.82)
Chronic pain (yes)	<0.001*	3.21 (1.74–5.95)*	3.16 (1.70–5.90)*
Newly emerged pain (yes)	0.233	1.38 (0.81–2.34)	1.40 (0.82–2.40)
Fatigue (yes)	0.024*	2.46 (1.17–5.17)*	2.32 (1.09–4.95)*
Mental discomfort (yes)	<0.001*	3.47 (1.83–6.60)*	3.62 (1.85–7.08)*
Skin problems and wounds (yes)	0.0289*	0.23 (0.06–0.97)*	0.23 (0.05–0.94)*
Suspicion of serious illness (yes)	0.001*	4.21 (1.96–9.06)*	4.22 (1.95–9.14)*
New injury (yes)	0.720	0.86 (0.39–1.94)	0.83 (0.37–1.89)
Newly emerged disease (yes)	0.328	1.27 (0.78–2.07)	1.20 (0.74–1.96)
General health checkup (yes)	0.013*	0.45 (0.24–0.86)*	0.43 (0.23–0.83)*
Vaccination (yes)	0.054	0.33 (0.10–1.08)	0.33 (0.10–1.07)
Follow-up on non-chronic physical illness (yes)	0.827	1.08 (0,52–2.24)	1.04 (0.50–2.17)
Other reasons[‖] (yes)	0.384	0.74 (0.38–1.46)	0.75 (0.38–1.50)

The answer "yes" is presented; the answer "no" is the reference.
*$P < 0.05$.
[†]Adjusted for sex, age, BMI, and general practice.
[§]Insufficient data to calculate OR.
[‖]Other reasons: visits for prescription renewal, virus/flu symptoms, pregnancy examination, investigation of familial predisposition to disease, musculoskeletal disorders, follow up of old injury, medical certificate, and reasons unknown.BMI, body mass index; RFI, reduced food intake

No association was seen between sex and age compared with UWL and RFI combined ($P = 0.982$ and 0.067, respectively). Patients in obesity class 1 to 3 had lower odds of having UWL and RFI combined compared with normal weight individuals (OR, 0.17; 95% CI, 0.07–0.44). These results are presented in Table 9.

Patients who visited the general practitioner had higher odds of having UWL and RFI combined (OR, 1.27; 95% CI, 0.60–2.71), but it was not significant. Patients who visited the general practice for follow up of chronic physical illness had higher odds of having UWL and RFI combined (OR, 2.71; 95% CI, 1.13–6.50). Patients who visited the general practice for a general health check had lower odds of having UWL and RFI combined (OR, 0.22; 95% CI, 0.06–0.80). These results are presented in Table 10.

Discussion

In this study, we examined the prevalence of risk for malnutrition using UWL and RFI in 1087 patients in five general practices in Denmark. Overall, 14.2% had an UWL, whereas 12.9% had RFI where the weight loss had a median value of 4 kg. This prevalence is consistent with the results from other studies [29–32], but the prevalence in this study is slightly lower compared with findings from 2018 [8]. The median BMI in this study was 26.3 kg/m^2, which indicates that most of the participating patients were overweight [44] but an UWL can be detrimental even in overweight patients. One study found that survival in patients was negatively affected by the percentage of weight loss in patients with cancer, even though the patients had a high BMI [20]. In the present study, median age was 58 y, and the median age for the patients with UWL was 57.5 y. Participants were ≥70 y in the study from 2018

Table 9
Association between unintended weight loss and reduced food intake combined and sex, age. and BMI

Unintended weight loss + Reduced food intake (yes) Variable = 137	OR (95% CI)	*P-value*
Sex		0.982
Women	Reference	
Men	0.92 (0.47–2.10)	
Age, y		0.067
18–39	Reference	
40–59	0.61 (0.24–1.55)	
60–79	1.27 (0.50–3.27)	
80–99	4.34 (0.88–21.39)	
BMI[†]		0.002*
Underweight	0.86 (0.16–4.63)	
Normal weight	Reference	
Overweight	0.43 (0.16–1.14)	
Obesity class 1, 2, and 3	0.17 (0.07– 0.44)*	

BMI, body mass index; RFI, reduced food intake; UWL, unintended weight loss.
*$P < 0.05$.
[†]BMI defined according to world Health Organization definition [44].

Table 10
Association between unintended weight loss and reduced food intake combined and visit to general practice and reason for visit

Unintended weight loss + Reduced food intake (yes) Variable = 137	*P*-value	OR (95% CI)
Visit to general practice		
General practitioner (yes)	0.535	1.27 (0.60–2.71)
Nurse (yes)	0.520	0.78 (0.37–1.65)
Reason for visit		
Follow-up of chronic illness (yes)	0.022*	2.71 (1.13–6.50)*
Chronic pain (yes)	0.390	2.06 (0.56–7.65)
New-onset pain (yes)	0.233	0.56 (0.21–1.50)
Fatigue (yes)	0.175	0.41 (0.11–1.51)
Mental discomfort (yes)	0.392	0.63 (0.21–1.89)
Skin problems and wounds (yes)	1.000	—[‡]
Suspicion of serious illness (yes)	0.172	4.82 (0.60–38.96)
New injury (yes)	0.676	0.57 (0.12–2.67)
New-onset disease (yes)	0.638	0.80 (0.31–2.06)
General health checkup (yes)	0.035*	0.22 (0.06–0.80)*
Vaccination (yes)	0.223	0.21 (0.02–2.41)
Follow up of non-chronic illness (yes)	0.456	0.53 (0.13–2.07)
Other reasons[§] (yes)	0.723	1.84 (0.37–9.06)

The answers "yes" are presented; the answer "no" is the reference.
*$P < 0.05$.
[‡]Insufficient data to calculate OR.
[§]Other reasons: visits for prescription renewal, virus/flu symptoms, pregnancy examination, investigation of familial predisposition to disease, musculoskeletal disorders, follow up of old injury, medical certificate, and reasons unknown.

[8]. Age can have an effect, as the present study found that patients in the 80 to 99 y age group had higher odds of having UWL compared with patients 60 to 79 y of age. This suggests that older people may be at higher risk for UWL. A pilot study from Australia found that older people are conscious of nutrition, but they lack knowledge about the benefits of protein intake and of good nutrition [35]. Therefore, there may be an incentive for early detection of malnutrition in the elderly, so they can get individual, preventive advice and guidance about good nutrition. This approach support ESPEN geriatric nutrition guidelines from the European Society for Clinical Nutrition and Metabolism [46]. The prevalence of nutrition risk among patients in this study is lower compared with the findings found in both inpatients and outpatients [3–7,10,14]. However, of the present sample, 329 patients visited the general practice for general health checkups, vaccinations, and "other reasons" including pregnancy tests. Therefore, according to criteria from the Global Leadership Initiative on Malnutrition, the patients in the present study may, to a lesser degree, have either chronic or acute inflammation than those in otherwise comparable studies [19].

In this study, the most common NIS for UWL and RFI were decreased appetite (60.8% and 65%), pain (29.4% and 29.2%), and worries (28.1% and 29.9%). Other studies have found decreased appetite and pain in relation to disease-related malnutrition [2–8]. Therefore, the results can be generalized to other countries with the same type of health care system as Denmark. Risk factors, however, may depend on setting, which should be considered regarding thorough nutritional assessment and intervention [47,48].

The increased risk between UWL and RFI and chronic pain, mental discomfort, and suspicion of serious illness ($P < 0.05$; OR, >1) might turn the focus on especially mental discomfort, as this may not always be associated with the need for nutrition intervention. We sought "mental discomfort" in order to reduce the questionnaire and thus have people attend. However, depression as an area within mental discomfort has formerly been associated with malnutrition [48,49]. General practice may be a very relevant setting to have this in mind, as no other setting has early visits with patients with mental discomfort. Other mental conditions may, however, also be interesting, although for psychiatric diseases as such, many have been associated with overweight [50]. A study from London found that different variables were used to identify malnutrition across different settings [51]. Many general practitioners recognized that it was difficult to identify malnutrition when they met the patient at first unless it was clinically clear. Signs of self-neglect, cognitive problems, recurrent falls, or self-reported fatigue were risk factors that aroused suspicion [51]. There are some similarities between the present study and the study from London regarding mental discomfort and fatigue and because of that, the general practitioner should keep an eye on these factors to identify patients at risk for malnutrition. In the study from London, some dietitians thought that general practitioners should identify the risk for malnutrition due to the annual checkup and flu vaccination [51]. However, this study found that patients who visit general practice for general health checkups and vaccinations had lower risk for both UWL and RFI. Therefore, these causes should be further investigated so general practitioners find it relevant to identify patients at risk for malnutrition, for instance in the elderly, as recommended by the National Health Authority [36,37].

Additionally, an association was found between UWL and RFI, where patients with UWL have higher risk for having RFI ($P < 0.05$). In this study 154 patients of the total population had UWL (14.2%), 140 had RFI (12.9%), 58 had UWL without RFI (5.3%), 44 had RFI without UWL (4.0%), 96 had both RFI and UWL (8.8%), and 198 had either RFI or UWL (18.2%). Due to the seemingly positive association between UWL and RFI, examining the sensitivity and specificity was not possible in this study. We suggest that UWL alone may be relevant and feasible to use as an initial indicator for the need for further malnutrition screening and assessment in patients in general practice. UWL is easy and practicable, thus opening the possibility of early detection of malnutrition as a manageable task for general practice. Intended weight loss was included as a variable in this study. This is due to the fact that overall weight loss has been shown to be a risk factor in many populations. However, no studies have made a distinction between intention to or not to lose weight within the past period. As obesity is increasing in society, many people diet, leading to 28.312 hits in a PubMed search of "diet for weight loss." We find it relevant not to exclude this term, since even though we did not discuss this in the present study, this might be a field for further investigation.

Study strengths and limitations

The present study had some strengths and limitations. A vast amount of data was collected in general practice with different internal organizations and both city and country represented, thus strengthening the results generalizability to other settings. Data were collected consecutively for 4 d in each setting, which adds to the representativity of the sample for the general Danish population. Finally, data were collected by the presence of three investigators who have experience with questionnaire data collection among patients. This resulted in a low number of patients not willing to participate, with a positive effect on the study's reliability.

During the data collection, some overweight women were not willing to disclose their weight, and therefore were excluded from the study. This may have affected the generalizability of the results. The study collected self-reported data of UWL within 2 mo, and it was not possible to examine whether the results were affected by recall or information bias regarding weight loss. The questionnaire used had some limitations. The "intended weight loss" lacked having a time interval. Thus, some patients may have regarded "intended weight loss" to be within the 2 mo as for UWL, however, some may have reported intended weight loss for a longer period. Furthermore, some patients were confused, as they had RFI due to an intended weight loss. It affects the internal validity, but not the prevalence of UWL.

Conclusion

The prevalence of malnutrition was measured by the initial screening measurements UWL and RFI in 1087 patients in five general practices in Denmark. Overall, UWL was found in 14.2% and 62.3% of patients with UWL also had RFI, whereas 68.6% of patients with RFI also had UWL. In this study, the findings indicated that there is a high prevalence of UWL among patients in general practice, as initial indicators for malnutrition. Due to the association between UWL and RFI, UWL seems to be a relevant initial indicator for further malnutrition screening in general practice.

Chronic pain, mental discomfort, and suspicion of serious illness, as well as age >80 y and BMI <18.5 kg/m^2 were highly associated with UWL. Therefore, there is a need for awareness and early recognition of UWL, especially in these groups. Studies are needed to investigate the effect of interventions and outcomes.

Acknowledgments

The authors acknowledge the patients for participating in the study. They also acknowledge the staff in general practices for positive collaboration toward the study.

References

[1] Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. Clin Nutr 2017;36:49–64.

[2] Abbott J, Teleni L, McKavanagh D, Watson J, McCarthy AL, Isenring E. Patient-Generated Subjective Global Assessment Short Form (PG-SGA SF) is a valid screening tool in chemotherapy outpatients. Support Care Cancer 2016;24:3883–7.

[3] Holm MO, Mikkelsen S, Zacher N, Østergaard T, Rasmussen HH, Holst M. High risk of disease-related malnutrition in gastroenterology outpatients. Nutrition 2020;75−76:1–4.

[4] Holst M, Zacher N, Østergaard T, Mikkelsen S. Disease related malnutrition in hospital outpatients, - time for action. Int J Food Sci Nutr Res 2019;1(1):1002.

[5] Holst M, Rasmussen HH, Bruun KS, Otten RE, Geisler L. Nutritional risk in pulmonology outpatients and health professionals' perspectives on nutritional practice. J Nurs Stud Patient Care 2019;1:1–7.

[6] Lindqvist C, Slinde F, Majeed A, Bottai M, Wahlin S. Nutrition impact symptoms are related to malnutrition and quality of life – a cross-sectional study of patients with chronic liver disease. Clin Nutr 2020;39:1840–8.

[7] Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008;27:5–15.

[8] Jensen SA, Rasmussen HH, Engsig A, Holst M. Nutritional impact symptoms evoking unintended weight loss among elderly patients in general practice. Integr Clin Med Ther 2018;1:1–8.

[9] Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. Int J Environ Res Public Health 2011;8:514–27.

[10] Hersberger L, Bargetzi L, Bargetzi A, Tribolet P, Fehr R, Baechli V, et al. Nutritional risk screening (NRS 2002) is a strong and modifiable predictor risk score for short-term and long-term clinical outcomes: secondary analysis of a prospective randomised trial. Clin Nutr 2020;39:2720–9.

[11] Ingeman A, Andersen G, Thomsen RW, Hundborg HH, Rasmussen HH, Johnsen SP. Lifestyle factors and early clinical outcome in patients with acute stroke: a population-based study. Stroke 2017;48:611–7.

[12] National Alliance for Infusion Therapy and the American Society for Parenteral and Enteral Nutrition Public Policy Commitee and Board of Directors. Disease-related malnutrition and enteral nutrition therapy: a significant problem with a cost-effective solution. Nutr Clin Pract 2010;25:548–54.

[13] Saunders J, Smith T. Malnutrition: causes and consequences. Clin Med 2010;10:624–7.

[14] Fernández AC, Casariego AV, Rodríguez IC, Pomar MDB. Malnutrition in hospitalized patients receiving nutritionally complete menus: prevalence and outcomes. Nutr Hosp 2014;30:1344–9.

[15] Aapro M, Arends J, Bozzetti F, Fearon K, Grunberg SM, Herrstedt J, et al. Early recognition of malnutrition and cachexia in the cancer patient: a position paper of a European School of Oncology Task Force. Ann Oncol 2014;25:1492–9.

[16] Marshall S, Bauer J, Isenring E. The consequences of malnutrition following discharge from rehabilitation to the community: a systematic review of current evidence in older adults. J Hum Nutr Diet 2014;27:133–41.

[17] Guest JF, Panca M, Baeyens JP, de Man F, Ljungqvist O, Pichard C, et al. Health economic impact of managing patients following a community-based diagnosis of malnutrition in the UK. Clin Nutr 2011;30:422–9.

[18] Abbott J, Teleni L, McKavanagh D, Watson J, McCarthy A, Isenring E. A novel, automated nutrition screening system as a predictor of nutritional risk in an oncology day treatment unit (ODTU). Support Care Cancer 2014;22:2107–12.

[19] Cederholm T, Jensen GL, Correia MITD, Gonzalez MC, Fukushima R, Higashiguchi T, et al. GLIM criteria for the diagnosis of malnutrition – a consensus report from the global clinical nutrition community. Clin Nutr 2019;38:1–9.

[20] Martin L, Senesse P, Gioulbasanis I, Antoun S, Bozzetti F, Deans C, et al. Diagnostic criteria for the classification of cancer-associated weight loss. J Clin Oncol 2015;33:90–9.

[21] Loh KW, Vriens MR, Gerritsen A, Borel Rinkes IHM, van Hillegersberg R, Schippers C, et al. Unintentional weight loss is the most important indicator of malnutrition among surgical cancer patients. Neth J Med 2012;70:365–9.

[22] Tangvik RJ, Tell GS, Eisman JA, Guttormsen AB, Henriksen A, Nilsen RM, et al. The nutritional strategy: four questions predict morbidity, mortality and health care costs. Clin Nutr 2014;33:634–41.

[23] Lang J, Shao Y, Liao J, Chen J, Zhou X, Deng R, et al. Patient-Generated Subjective Global Assessment (PG-SGA) predict length of hospital stay in lung adenocarcinoma patients. Br J Nutr 2021:1–20.

[24] Ravasco P, Monteiro-Grillo I, Camilo M. Individualized nutrition intervention is of major benefit to colorectal cancer patients: long-term follow-up of a randomized controlled trial of nutritional therapy. Am J Clin Nutr 2012;96:1346–53.

[25] Brown F, Fry G, Cawood A, Stratton R. Economic impact of implementing malnutrition screening and nutritional management in older adults in general practice. J Nutr Heal Aging 2020;24:305–11.

[26] Buitrago G, Vargas J, Sulo S, Partridge JS, Guevara-Nieto M, Gomez G, et al. Targeting malnutrition: nutrition programs yield cost savings for hospitalized patients. Clin Nutr 2020;39:2896–901.

[27] Van Bokhorst-de van der Schueren MAE, Guaitoli PR, Jansma EP, de Vet HCW. Nutrition screening tools: does one size fit all? A systematic review of screening tools for the hospital setting. Clin Nutr 2014;33:39–58.

[28] Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening. Clin Nutr 2002;2003(22):415–21.

[29] Bouëtté G, Esvan M, Apel K, Thibault R. A visual analogue scale for food intake as a screening test for malnutrition in the primary care setting: prospective non-interventional study. Clin Nutr 2021;40:174–80.

[30] Donini LM, Marrocco W, Marocco C, Lenzi A. Validity of the Self-Mini Nutritional Assessment (Self-MNA) for the evaluation of nutritional risk. A cross-sectional study conducted in general practice. J Nutr Heal Aging 2018;22:44–52.

[31] Hamirudin AH, Charlton K, Walton K, Bonney A, Potter J, Milosavljevic M, et al. Feasibility of implementing routine nutritional screening for older adults in Australian general practices: a mixed-methods study. BMC Fam Pract 2014;15:1–9.

[32] Winter J, Flanagan D, McNaughton SA, Nowson C. Nutrition screening of older people in a community general practice, using the MNA-SF. J Nutr Heal Aging 2013;17:322–5.

[33] Schilp J, Kruizenga HM, Wijnhoven HAH, Leistra E, Evers AM, van Binsbergen JJ, et al. High prevalence of undernutrition in Dutch community-dwelling older individuals. Nutrition 2012;28:1151–6.

[34] Beck AM, Ovesen L, Schroll M. A six months' prospective follow-up of 65 + -y-old patients from general practice classified according to nutritional risk by the Mini Nutritional Assessment. Eur J Clin Nutr 2001;55:1028–33.

[35] Preston D, Nguyen TNM, Visvanathan R, Wilson A. Nutrition and the community-dwelling older person: A pilot study in general practice. Int J Evid Based Healthc 2018;16:73–80.

[36] Bech AM, Borre M, Holst M, Højgaard H, Hansen BS, Kondrup J, et al. Professional recommendations and descriptions of good practice for nutritional efforts for the elderly with unplanned weight loss. The National Board of Health and Welfare; 2015. https://www.sst.dk/-/media/Udgivelser/2015/anbefalinger-til-aeldre-med-uplanlagt-vaegttab/2015-AEldre_vaegttab_anbefalinger.ashx?la=da&hash=02CFCF7F148D0F1E81D1C968E3E3781ADC74D1E3. Accessed December 22, 2021.

[37] The National Board of Health. Presentation on nutritional interventions for the elderly medical patient. The National Board of Health; 2017. https://www.sst.dk/da/udgivelser/2017/~/media/22323598F18747A984BF146E72E14FA8.ashx. Accessed December 22, 2021.

[38] The National Board of Health. Tools for early detection of disease signs, reduced level of physical function and malnutrition - summary of recommendations. National Board of Health, 2013. Accessed December 22, 2021. https://www.sst.dk/-/media/Udgivelser/2013/Publ2013/V%C3%A6rkt%C3%B8jer-til-tidlig-opsporing-af-sygdomstegn,-nedsat-fysisk-funktionsniveau-og-undervern%C3%A6ring.ashx

[39] Sanders KJC, Hendriks LE, Troost EGC, Bootsma GP, Houben RMA, Schols AMWJ, et al. Early weight loss during chemoradiotherapy has a detrimental impact on outcome in NSCLC. J Thorac Oncol 2016;11:873–9.

[40] Fearon K, Strasser F, Anker SD, Bosaeus I, Bruera E, Fainsinger RL, et al. Definition and classification of cancer cachexia: an international consensus. Lancet Oncol 2011;12:489–95.

[41] The National Board of Health. Early detection of impaired health and impaired functioning in the elderly. National Board of Health; 2017. https://www.sst.dk/-/media/Udgivelser/2017/Tidlig-opsporing-af-forringet-helbredstilstand-og-nedsat-funktionsevne-hos-aeldre-mennesker.ashx?la=da&hash=EC4A2AD6BA14C83565EEFB546B268CAE396D41BF. Accessed December 22, 2021.

[42] Holst M, Beermann T, Mortensen MN, Skadhauge LB, Lindorff-Larsen K, Rasmussen HH. Multi-modal intervention improved oral intake in hospitalized patients. A one year follow-up study. Clin Nutr 2015;34:315–22.

[43] Kondrup J, Rasmussen HH, Hamberg OLE, Stanga Z, Camilo M, Richardson R, et al. Nutritional risk screening (NRS 2002): a new method based on an analysis of controlled clinical trials. Clin Nutr 2003;22:321–36.

[44] World Health Organization. Body mass index. Geneva, Switzerland: Auutho r.

[45] Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Int J Surg 2014;12:1495–9.

[46] Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clin Nutr 2019;38:10–47.

[47] Fávaro-Moreira NC, Krausch-Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, et al. Risk factors for malnutrition in older adults: a systematic review of the literature based on longitudinal data. Adv Nutr 2016;7:507–22.

[48] Holst M, Yifter-Lindgren E, Surowiak M, Nielsen K, Mowe M, Carlsson M, et al. Nutritional screening and risk factors in elderly hospitalized patients: association to clinical outcome? Scand J Caring Sci 2013;27:953–61.

[49] Mantzorou M, Vadikolias K, Pavlidou E, Serdari A, Vasios G, Tryfonos C, et al. Nutritional status is associated with the degree of cognitive impairment and depressive symptoms in a Greek elderly population. Nutr Neurosci 2020;23:201–9.

[50] Albieri J, Ferrara P, Terzoni S, Salcuni S, Destrebecq A, Gambini O. Assessment of nutritional risk in persons with mental health disorders admitted to the acute psychiatric inpatient unit: an Italian study. Prof Inferm 2020;73:196–204.

[51] Avgerinou C, Bhanu C, Walters K, Tuijt R, Rea J, Kharicha K, et al. Supporting nutrition in frail older people: a qualitative study exploring views of primary care and community health professionals. Br J Gen Pract 2020;70:138–45.