

ASSESSING NUTRITIONAL STATUS AMONG COGNITIVE IMPAIRED ADULTS

**Nutritional screening of patients at a memory clinic –
association between patients' self-reports and their
relatives' scores using the same instrument**

Anne Liv Lyngroth,



UNIVERSITY OF OSLO

Thesis in advanced geriatric nursing
Master's degree
Institute of Health and Society
Department of Nursing Science

Masteroppgave i avansert geriatrisk sykepleie
Institutt for helse og samfunn
Avdeling for sykepleievitenskap

May 26. 2014



UNIVERSITETET I OSLO
 DET MEDISINSKE FAKULTETET
 Institutt for helse og samfunn, Avdeling for
 sykepleievitenskap.
 Boks 1130 Blindern, 0318 Oslo

Name: Anne Liv Lyngroth	Date: May 26. 2014
Title: ASSESSING NUTRITIONAL STATUS AMONG COGNITIVE IMPAIRED ADULTS Nutritional screening of patients at a memory clinic – association between patients’ self-reports and their relatives’ scores using the same instrument	
<p>Abstract</p> <p>Aims and objectives. To increase knowledge about nutritional screening of individuals with cognitive impairment 1) when the Nutritional Form For the Elderly (NUFFE) was filled in by both patient and relatives, 2) when the screening results were compared to Mini Mental Status (MMSE), weight loss, Body Mass Index (BMI), and background variables, and 3) when MMSE was compared to weight loss, BMI and background variables. The aim was thus to obtain knowledge of nutritional screenings of persons examined at a memory clinic.</p> <p>Background. Undernutrition or risk of undernutrition is a significant problem among the elderly, particularly among those suffering from dementia.</p> <p>Design. A cross sectional study.</p> <p>Method. Nutritional screening conducted through patients’ self-reporting and their relatives’ scores using NUFFE-NO (Norwegian version).</p> <p>Results. A total of 213 patients, average age of 73 years were included in the study. In the sample, 53% were females, 15% were under the age of 65 and 32% lived alone. The mean MMSE score was 23.2 and 50% had non-approved the five-point Clock Drawing Test. Patients’ and relatives’ NUFFE-scores yielded comparative results, however patients rated themselves somewhat more well-nourished than what their relatives did. According to the patients NUFFE-scores 32% were at medium to high risk of undernutrition, while NUFFE-scores from the patients’ closest relatives showed 43% medium to high risk. Involuntary weight loss was reported by 42% of the patients and in 26.4% of the population BMI-values were below 22 kg/m², indicating undernutrition.</p> <p>Conclusion. The study demonstrates that a significant proportion of patients at our memory clinic were in nutritional risk. Considerable comparative results existed between patients’ and their relatives’ NUFFE-scores. In our sample women are more exposed to unfavorable nutrition profile than men and it is favorable not to live alone. A MMSE-test and the Clock Drawing Test may predict weight loss.</p>	
Key words: elderly, dementia, cognitive impairment, malnutrition, nutritional screening, NUFFE-NO, proxy-rating	



UNIVERSITETET I OSLO
 DET MEDISINSKE FAKULTETET
 Institutt for helse og samfunn, Avdeling for
 sykepleievitenskap.
 Boks 1130 Blindern, 0318 Oslo

Navn: Anne Liv Lyngroth	Dato: 26.05.14
Tittel: ASSESSING NUTRITIONAL STATUS AMONG COGNITIVE IMPAIRED ADULTS	
Ernæringscreening av pasienter som utredes ved en hukommelsesklinikk-sammenhenger i skåringer ved pasienters selvrapporing og pårørendes skåringer på samme instrument	
Sammendrag:	
<p>Mål og hensikt. Hensikten med denne studien var å øke kunnskapen om ernæringscreening hos personer med kognitiv svikt 1) når instrumentet The Nutritional Form For the Elderly (NUFFE) ble besvart både av pasient og pårørende, 2) når screeningresultatet ble relatert til Mini Mental Status (MMSE), vekttap, kroppsmasseindeks (KMI) og bakgrunnsvariabler og 3) når MMSE ble relatert til vekttap, KMI og bakgrunnsvariabler. Målet var derfor å skaffe kunnskap om ernærings-screening for personer som undersøkes ved en hukommelsesklinikk.</p> <p>Bakgrunn. Underernæring eller risiko for underernæring er et stort problem blant eldre. Personer med demens er spesielt utsatt.</p> <p>Design. Tverrsnittstudie.</p> <p>Metode. Ernæringscreening for 213 pasienter ble utført ved pasientenes selvrapporing og pårørendes skåringer ved bruk av NUFFE-NO (norsk versjon). Høyere screening-skåre indikerte høyere risiko for underernæring. Pasientenes demografiske variabler, og kognitiv nivå (målt ved MMSE og Klokke-test) ble registrert.</p> <p>Resultater. Totalt ble 213 pasienter med gjennomsnittsalder 73 år inkludert i studien. I utvalget var andelen kvinner 53%, 15% var under 65 år og 32% bodde alene. MMSE gjennomsnittsskåre var 23,2 og 50% hadde ikke-godkjent fem-poengs Klokke-test. Funnene viste samsvar mellom pasienters og pårørendes NUFFE-skåringer, men pasientene vurderte seg i noe større grad som mer velernært enn pårørendes rapportering. Pasientenes registreringer viste at 32% var i middels eller høy risiko for underernæring, 43% for pårørendes skåringer. Ufrivillig vekttap ble registrert hos 42% av pasientene og 26,4% i utvalget hadde KMI-verdier under 22 kg/m², noe som indikerer underernæring.</p> <p>Konklusjon. Studien viser at en betydelig andel av pasientene ved denne hukommelsesklinikken var i ernæringsmessig risiko. Det var betydelig sammenfallende resultater mellom pasientenes og pårørendes NUFFE-skåringer, men pasientene vurderte seg som mer velernært enn pårørende. I vårt utvalg var kvinner mer utsatt for ugunstig ernæringsprofil enn menn og i forhold til ernæringsstatus var det gunstig å ikke bo alene. Lavere MMSE-skåre øker risikoen for underernæring. MMSE-test og klokke-test kan predikere vekttap.</p>	
Nøkkelord: eldre, demens, kognitiv svikt, underernæring, ernæringscreening, NUFFE-NO, pårørenderapportering	

Acknowledgements

For the last three years I have studied advanced geriatric nursing, master's degree. Now the master thesis has been completed. There have been three challenging and educational years. The present work is in article format. The goal is to get the article published in the *The Journal of Clinical Nursing* (JCN).

The thesis had not been completed without support and good guidance of Ellen Karine Grov and help and advice of colleague Susanne M Sørensen Hernes. Thanks also to all the other authors for valuable contributions!

Without the support and goodwill from the Medical Department at Sorlandet Hospital, the master's thesis had not been possible to achieve. Thanks also to my dear colleagues at the Memory Clinic and fellow students who have shared knowledge, experience and inspiration! I am grateful to participating patients and their relatives at the Memory Clinic.

Finally, thanks to my beloved family, Knut, Maria, Anders and Bjørn! You have shown me support and the importance of the life outside the studies.

Arendal, May 26.2014

Anne Liv Lyngroth

ASSESSING NUTRITIONAL STATUS AMONG COGNITIVE IMPAIRED ADULTS**Nutritional screening of patients at a memory clinic –
association between patients' self-reports and their relatives' scores using the same
instrument**

Correspondence*:

*Anne Liv Lyngroth, RN, MAGN

Sorlandet Hospital Arendal, The Memory Clinic, Postbox 783 Stoa, 4809 Arendal, Norway

E-mail: [hopla63@live.no](mailto:hopl63@live.no)

Phone + 47 48091871

Susanne Miriam Sørensen Hernes, Cand Med, PhD

Department of Geriatrics and Internal Medicine, Sorlandet Hospital Arendal, Postbox 783 Stoa,
4809 Arendal, Norway

E-mail: drhernes@gmail.com

Bengt-Ove Madsen, Occupational Therapist

Sorlandet Hospital Arendal, The Memory Clinic, Postbox 783 Stoa, 4809 Arendal, Norway

E-mail: bengt-ove.madsen@sshf.no

Ulrika Söderhamn, RN, PhD, Professor

University of Agder, Faculty of Health and Sports Sciences

E-mail: ulrika.soderhamn@uia.no

Ellen Karine Grov, RN, PhD Professor

University of Oslo, Institute of Health and Society

E-mail: e.k.grov@medisin.uio.no

Abstract: 300, Manuscript: 4335, References: 40, Tables: 3, Short title: Assessing Nutritional Status Among Impaired Adults

**Nutritional screening of patients at a memory clinic-
association between patients' self-reports and their relatives' scores using the same
instrument**

Abstract

Aims and objectives. To increase knowledge about nutritional screening of individuals with cognitive impairment 1) when the Nutritional Form For the Elderly (NUFFE) was filled in by both patient and relatives, 2) when the screening results were compared to Mini Mental Status (MMSE), weight loss, Body Mass Index (BMI), and background variables, and 3) when MMSE was compared to weight loss, BMI and background variables. The aim was thus to obtain knowledge of nutritional screenings of persons examined at a memory clinic.

Background. Undernutrition or risk of undernutrition is a significant problem among the elderly, particularly among those suffering from dementia.

Design. A cross sectional study.

Method. Nutritional screening conducted through patients' self-reporting and their relatives' scores using NUFFE-NO (Norwegian version).

Results. A total of 213 patients, average age of 73 years, were included in the study. In the sample, 53% were females, 15% were under the age of 65 and 32% lived alone. The mean MMSE score was 23.2 and 50% had non-approved the five-point Clock Drawing Test. Patients' and relatives' NUFFE-scores yielded comparative results, however patients rated themselves somewhat more well-nourished than what their relatives did. According to the patients NUFFE-scores 32% were at medium to high risk of undernutrition, while NUFFE-scores from the patients' closest relatives showed 43% medium to high risk. Involuntary weight loss was reported by 42% of the patients and in 26.4% of the population BMI-values were below 22

kg/m², indicating undernutrition.

Conclusion. The study demonstrates that a significant proportion of patients at the memory clinic were in nutritional risk. Considerable comparative results existed between patients' and their relatives' NUFFE-scores. In our sample women are more exposed to unfavorable nutrition profile than men and it is favorable not to live alone. A MMSE-test and the Clock Drawing Test may predict weight loss.

Implication for practice.

- Self-reporting and proxy-rating seems appropriate when nutritional status should be assessed among cognitive impaired adults in order to obtain knowledge of the patients' insight and relatives' experience of nutrition profile.
- In clinical settings when screening it should be clearly stated who is the source of information.
- NUFFE seems to be an appropriate instrument for assessing nutritional statuses among cognitive impaired adults.

Keywords: Elderly, dementia, cognitive impairment malnutrition, nutritional screening, NUFFE-NO, proxy-rating

Introduction

Undernutrition often is not acknowledged in elderly individuals (Suominen *et al.* 2009, Marco *et al.* 2011), which may lead to serious consequences such as reduced quality of life, worsening of physical and mental functions, increase risk of infections and delayed convalescence after acute illness leading to increased cost of society (Sørbye *et al.* 2008, Helsedirektoratet, 2009, Marco *et al.* 2011). Undernutrition is defined as “nutritional status where lack of energy, protein and/or nutrients causes measurable negative effects to the body composition, functions and clinical results” (Helsedirektoratet, 2009, p. 14). The Body Mass Index (BMI) illustrates the correlation between height and weight and provides a measurable entity of the individual nutritional status (Helsedirektoratet, 2009). In elderly persons BMI ranging from 25.0-29.9 (kg/m²) correlates with increased life expectancy (Kvamme *et al.* 2012). According to the World Health Organization (WHO), the BMI of persons above 65 years should be at 24.0-29.0 and BMIs below 22.0 is sign of undernutrition (Helsedirektoratet, 2009). Nordic studies of home-dwelling elderly individuals revealed that one of five persons was at nutritional risk (Söderhamn *et al.* 2012, Tomstad *et al.* 2012). Similarly, a Canadian study found that 34% of elderly people living at home were at nutritional risk (Ramage-Morin & Garriguet, 2013). Although a multifactorial cause of undernutrition is common, people suffering from dementia are particularly susceptible (Roque *et al.* 2013). Changes in perception of taste and smell may reduce appetite, in addition visual deterioration, concentration problems, and apraxia may affect food intake (Chang & Roberts, 2011). A decreased nutritional status is associated with impairment of the cognitive, functional and behavioral profile as well as increased care-burden (Chang & Roberts, 2011, Roque *et al.* 2013). A strong association is found between nutritional risk and neuropsychiatric symptoms (Gianluca & Massimiliano, 2011, Roque *et al.* 2013). We know little of diets, self-reported

health-related quality of life and nutrition in people with mild cognitive impairment or dementia. In a study on elderly individuals with acute illness admitted to a geriatric ward, 19% of the patients with normal cognitive status were in a state of undernutrition, whereas the corresponding numbers were 47% for mild cognitive impaired (MCI) and 62% for established dementia (Orsotto, 2012). Studies of elderly patients with cognitive impairment or dementia who live at home have found that half of their subjects suffered from undernutrition or were at nutritional risk (Rognstad *et al.* 2013, Roque *et al.* 2013).

Studies demonstrate lack of knowledge regarding the assessment of nutritional status and unsatisfactory nutritional practice (Mowe *et al.* 2008, Suominen *et al.* 2009, Tangvik *et al.* 2012, Aagaard & Grøndahl, 2013). In Finland, nurses recognized undernourished elderly patients when anorexic, but not with less severe undernutrition. Only one of six undernourished patients was given nutritional supplements (Suominen *et al.* 2009). Practice related to nutritional screening and treatment among elderly was evaluated as too poor in two of three Norwegian municipalities (Aagaard & Grøndahl, 2013). A lack of commitment leads to unstructured and haphazard nutritional treatment (Helsedirektoratet, 2009, Juul & Frich, 2013). Undernutrition develops over time and early screening may identify individuals at nutritional risk and possible discover sites of intervention. Reliable screening tools customized for older patients should be used routinely (Kaiser *et al.* 2009, Callen, 2010, Söderhamn *et al.* 2012). In cases of cognitive impairment, it is unknown whether there exist tools specific for assessing nutritional status (Faxen-Irving, 2008). The Mini Nutritional Assessment (MNA) has been used (Coin *et al.* 2012, Orsotto, 2012, Roque *et al.* 2013), even when someone else than the patient (proxy-rating) has answered the questions (Guigoz, 2006, Rognstad *et al.* 2013).

Several studies have examined the different aspects of patients' self-reports and their relatives' scores using the same instrument as the patients. In patients with early dementia Meyer *et al.* (2014) found that self-reported instrumental activities of daily life (I-ADL) might be more accurate than their relatives' assessments. Bradford *et al.* (2012) found a similar reliability in assessment of anxiety symptoms when persons with mild to moderate dementia and their relatives scored the same form. Arlt *et al.* (2008) assert that while patients with cognitive impairment are important informants for imparting their own quality of life and symptoms of depressions, but they often underestimate the level of cognitive impairment. A high correlation between physicians' assessment of depression, the patients' self-reports and their relatives' estimation of mental health were found. Lukas *et al.* (2013) found self-reports on pain assessment among geriatric patients to be valuable. Ranhoff and Laake (1993) found that self-reported information of daily life activities (ADL) in patients with cognitive impairment were not reliable. These studies demonstrate that the accuracy of screening depends on who is scoring and that it may be valuable to collect reports from both patients as well as their relatives.

The Nutritional Form For the Elderly (NUFFE) is a simple instrument designed to identify elderly persons at risk of undernutrition at an early stage (Söderhamn *et al.* 2009). The purpose of this study is to increase knowledge about nutritional screening of individuals with cognitive impairment when using the instrument NUFFE. The best method to screen persons with cognitive impairment as well as their nutritional status is not established. The aim of the study is thus to obtain knowledge of how to collect nutritional screenings of persons examined at a memory clinic.

The following research questions are posed:

- To what degree do patients' self-reports correlate to the scores of relatives when using NUFFE for screening at a memory clinic?
- How many patients' are assessed as undernourished or at risk of undernutrition based on patients' self-reports and their relatives' scores using NUFFE?
- To what degree does the NUFFE cut-off value of patients' and their relatives' relate to BMI, involuntary weight loss, MMSE, the Clock Drawing Test, sex, age and living arrangements?
- To what degree is cognitive impairment, measured by MMSE, associated with patients' sex, age, living arrangements, weight loss, BMI and NUFFE-scores for both patients and relatives?

Method

The study has a quantitative descriptive design. Data have been collected through measurements and use of validated screening instruments between January 2011 and February 2014.

Sample

The study was conducted at a memory clinic hospital in Norway. Individuals eligible for study inclusions were patients referred to assessment at the Memory Clinic due to suspected cognitive impairment or dementia. Relative accompanying the patients were also eligible for inclusion as informants. In total, 308 assessments were conducted during the sampling period. Data from 213 participants and their relatives were analyzed. The remaining assessments did not meet the requirements for inclusion, did not wish to participate or were omitted due to insufficient data. Both patients and their relatives provided written consent to participate in the study.

Recruitment and data collection

Participants were recruited by the memory clinic's permanent staff upon arrival. Patients and their relatives were given oral and written information. Specially trained health care professionals collected data as part of the clinic's standardised assessment. Background data such as age, sex, living arrangements, and unintentional weight loss were also included, as were cognitive tests such as MMSE and The Clock Drawing Test. The patients were interviewed about nutritional status using the Norwegian version of NUFFE-NO (NUFFE) and health care professionals assisted the patients in completing the form. The relatives filled in the nutritional screening form NUFFE separately. Weight and height were measured and BMI was calculated for each patient. The first author registered the data.

Instruments

NUFFE consists of 15 questions (with three answer options) regarding weight loss, changes in food intake, appetite, number of hot meals per day, portion size, intake of fruit or vegetables, access to food, company at meal, activity, difficulties eating because of problems with teeth, mouth, swallowing, fluid intake, difficulties eating caused by diarrhoea, constipation, nausea, or vomiting, assisted eating, number of medications, as well as difficulties eating because of poor health. A score of 0-6 points indicates lower risk, 6-11 points indicates medium risk, and 11< indicates higher risk of undernutrition (Söderham *et al.* 2009).

MMSE is the most common screening test used to assess cognitive impairment among the elderly. It tests orientation ability, memory, speech, comprehension, and visuconstructive ability.

Results from the MMSE test are often used to describe the severity of dementia. Scoring is rated 0-30. A low score suggests serious cognitive impairment (Forstein *et al.* 1975).

The Clock Drawing Test is a screening test that observes a person's ability to orient him or herself and perform in a space, simultaneously as it requires attentiveness and comprehension of numbers. The test also measures executive features. The patient is expected to fill in the numbers in the correct spots and then place the hands on the designated time. In this study, a score of 0-5, 0-3 points is not- approved, while 4-5 is approved (Strobel *et al.* 2012).

Ethics

Participants in this study are all able to give a valid informed consent. The study is part of the Registry Study, a registry for persons assessed at memory clinics in South-Eastern Norway Regional Health Authority and the Western Norway Regional Health Authority. The studies are approved locally by the Regional Ethical Committees. Consent forms were signed by both the patients and their accompanying relatives. It was made clear that participation or reservation would have no effect on assessment and treatment.

Analysis

Data were analysed using the statistical software SPSS, version 16.0, and descriptive statistics. T-tests were used for continuous variables to examine differences between groups. Chi-squared tests were used for categorical variables. Correlations between NUFFE-score results based on patients' self-reports and their relatives' scores (proxy-rating). Associations between NUFFE-screening results and patients' age, sex, living arrangements, MMSE values, Clock Drawing Test results, BMI- values, and weight loss were analysed by the use of linear and logistic regression analysis.

Results

We evaluated the nutritional status of 213 persons, 113 women and 110 men. The mean age in the study population was 73.1 years, median 74 (variance 35-95). The sample included 32 persons under the age of 65 years, and 69 persons lived alone. The mean MMSE score was 23.2 (variance 8-30). 107 patients passed the Clock Drawing Tests. The mean BMI was 25.2 kg/m² (variance 15.8-43.4) and 56 persons had BMI- values less than 22. Eighty-nine persons reported involuntary weight loss in the past six months. For further description of demographic and clinical variables, see Table 1.

Table 1 about here.

The study reveals significant correlation between patients' and their relatives' NUFFE-scores, the patients assess themselves as somewhat more well-nourished as reported by their relatives. When comparing mean NUFFE-scores reported by patients and relatives, the relatives assess the nutritional status as worse than the patients. When the NUFFE-scores were allotted into categories "well-nourished" or at "risk/undernourished" with a cut-off value of 6, we found that the average NUFFE-score from patients' self-reports was 4.7 points (variance 0-18). The average value for the relatives' scores was 5.9 (variance 0-21). The average of both groups in our sample is lower than the cut-off value for risk/undernutrition; the relatives' average score is just below the cut-off value.

Table 2 illustrates the differences between the patients' and their relatives' NUFFE-scores. The patients' registrations reveal that 69 persons (32.5%) were at a medium to high risk of undernourishment (NUFFE-score ≥ 6). Similar registration by relatives revealed 92 persons at the corresponding risk (43.4%). When NUFFE-scores were divided into three risk groups (low, medium, and high risk), the patients' and their relatives' division of risk scored corresponding in

68.5% of cases (scored in the same risk group). 23.5% of patients assessed their nutritional status in a lower risk group than did their relatives, and 7.5% of patients placed themselves in higher risk groups than did their relatives.

Table 2 about here.

Patients' and relatives' NUFFE- scores in relation to demographic data, involuntary weight loss, BMI, MMSE, and the Clock Drawing Test

The analysis indicates significant association between patients' and their relatives' NUFFE-scores (dependent variable, dichotomy, cut-off = 6 points) and involuntary weight loss. Involuntary weight loss is registered relatively more often in those with high NUFFE-scores (≥ 6), Table 2 ($p \leq 0,001$ for both groups). Correlation analyses show that involuntary weight loss correlates to NUFFE-registrations for patients ($r=0.41$), their relatives ($r=0.45$), and to the patients' and their relatives' NUFFE-scores ($r=0.66$).

Table 2 indicate significant association between patients' ($p=0.004$) and their relatives' NUFFE-scores ($p \leq 0.001$) and BMI (≥ 22). When NUFFE-score being lower than 6 (well-nourished), BMI-values ≥ 22 occur more often. In logistic regression analysis there were significant association between NUFFE-scores ($p \leq 0.001$) and BMI ≥ 22 based on the relatives' scores, but not based on the patient rating.

Table 2 illustrates the difference between NUFFE-scores and MMSE (categorized). The study shows that persons assessed at medium/high risk for undernutrition based on patients' and their relatives' NUFFE-scores more often score lower MMSE-values than do those who are well-nourished. We did not find a significant association between MMSE and NUFFE-scores (dichotomised) for patients and their relatives using logistical regression analysis.

Those demonstrating medium/high risk for undernourishment based on the patients' NUFFE-scores (dichotomised), relatively often have been unable to pass the Clock Drawing Test ($p=0.040$). We were unable to find such a correspondence based on scoring by the relatives (Table 2). Using regression analysis, we were also unable to find an association between NUFFE-scores for patients or relatives and the Clock Drawing Test.

Tables 1 and 2 illustrate the association between NUFFE-scores and sex. The result may imply that for those at nutritional risk (NUFFE-points ≥ 6), women are overrepresented compared to men, based both on the patients' and their relatives' scores. In logistic regression analysis we found significant association between patients' NUFFE-scores (dependent, dichotomy) and sex ($p=0.003$), but we were unable to find this based on the relatives' scores.

Table 2 reveals significant association between NUFFE-scores (from patients as well as relatives) and age. Patients over the age of 65 have a greater risk of undernutrition than the group under the age of 65. We were unable to find a significant association between the patients' and their relatives' NUFFE-scores and age using logistic regression analysis.

Table 2 also demonstrates associations between NUFFE-scores both from patients and their relatives and living arrangements. A larger portion of those persons with a poor nutritional profile (NUFFE ≥ 6) lived alone. By employing logistical regression analysis, we found significant association between NUFFE-scores both by patients and their relatives and living arrangements ($p\leq 0.001$). Based on the patients' NUFFE-scores (dependent variable, dichotomy), logistic regression analysis shows that involuntary weight loss, being female, and living alone increases the risk of undernutrition. The relatives' NUFFE-scores (dichotomised) imply that involuntary weight loss and living arrangements are risk factors.

Involuntary weight loss in relation to demographical data, BMI, MMSE, and the Clock Drawing Test

Our regression analyses were unable to find association between BMI- values and other variables except for involuntary weight loss. Because involuntary weight loss and BMI correlates at a 0.01 level, further analysis was made with the variable involuntary weight loss (Pearsons $r = 0.250$, $p=0.01$). In this sample, a greater number of women than men experienced involuntary weight loss (Table 3). We also found that women had a higher count of low BMI-values compared to men (Table 1). Involuntary weight loss in the past six months was reported more often in the oldest age-group (≥ 65) than in those under the age of 65 ($p=0.006$). This finding is also in line with the correlation between BMI and age (Table 1). We also found significant difference between involuntary weight loss and living arrangements (Table 3). Those not experiencing weight loss are more often living with someone.

Table 3 about here.

Table 3 illustrates significant association between weight loss and BMI. Persons with BMI less than 22 reported more frequent involuntary weight loss than did persons in the group with BMI values more than 22. Table 3 also demonstrates significant difference between weight loss and MMSE ($p<0.001$) as well as weight loss and the Clock Drawing Test ($p=0.008$). Persons with low MMSE values reported involuntary weight loss more frequently than did persons with higher MMSE values. Patients with non-approved Clock Drawing Tests also reported more frequent weight loss than did those with approved Clock Drawing tests. Being female, living alone, having a BMI <22 , a low MMSE score, and a non-approved Clock Drawing Test increase the risk of involuntary weight loss. Through the regression analyses, we found significant association between involuntary weight loss (dependent variable), and age ($p=0.015$), BMI

($p=0.046$) and NUFFE-scores from patients ($p=0.009$) and from relatives ($p=0.012$), but not for variables MMSE and the Clock Drawing Test. In the regression analysis, we only found significant association (<0.001) between MMSE (dependent variable) and age (dichotomised) and BMI (dichotomised). We found similar results with the Clock Drawing Test as a dependent variable, and age as a continuous variable ($p=0.014$). Table 1 reveals no significant difference between women and men in the selection for MMSE (categorized). Using linear regression analysis with MMSE (dependent, continuous variable) and involuntary weight loss and BMI (dichotomy) as independent variables, we found that MMSE may predict weight loss, ($p=0.004$). Using the same independent variables and the Clock Drawing test as a dependent variable, we also found the Clock Drawing Test (dichotomy) to be a predictor of weight loss ($p=0.019$).

Discussion

In our study, we found high correlation between patients' self-evaluated nutritional status and their relatives' registrations. According to patient registrations, 32.5% were at a nutritional risk; relatives reported 43.4 %. We found poorer nutritional profiles measured by NUFFE-screenings among persons over the age of 65, women, those living alone, and those who experiencing involuntary weight loss and a lower cognitive level measured by MMSE and the Clock Drawing Test. BMI-values over 22 were more frequent in cases of lower NUFFE-scores. Persons with low MMSE-values experienced involuntary weight loss more often. MMSE may predict weight loss.

These findings demonstrate that the patients assessed their nutritional status as better than their relatives did. The average NUFFE-score for patients is more than one point below their relatives' average score, and the discrepancy was close to 11% between the two groups' assessment of

nutritional risk. One might assume the patients have a somewhat reduced perception of their own nutritional status or a wish to be in a better nutritional state than they actually are. Several reports show patients suffering from mild cognitive impairment/early stage dementia may provide reliable self-evaluations and that this is valuable, concluding that information from the patient, relatives, and potential health care professionals should be combined in order to create a comprehensive idea of the patient's situation (Arlt *et al.* 2008, Bradford *et al.* 2012, Lukas *et al.* 2013, Martyr *et al.* 2014). Bradford (2012) claims that relatives' scores have a greater predictive value in comparison to self-evaluations.

The reasons for discrepancies between patients' and relatives' scores may be several. Previous studies disagree on the validity of patients' self-evaluations. Some studies argue that patients suffering from Alzheimer's disease tend to provide evaluations that are far too optimistic (Vogel *et al.* 2004). The severity of dementia has proven to be a deciding factor (Arlt *et al.* 2008). In cases of MMSE scores higher than of 20 points, Ranhoff and Laake (1989) found a greater correlation between the patient's self-evaluation and the physician's screening. In our selection, the MMSE average value was relatively high, 23.2, almost 30% of the examined persons had MMSE values of 27 or higher. In addition to a relatively low average age and inclusion of participants <65 years old, this may affect the high correlation between the patients' and their relatives' scores. Martyr *et al.* (2014) found that in addition to age, cognitive function was a deciding factor in terms of self-evaluation, and those factors such as lack of insight, behavioural symptoms, and symptoms of depression may affect the way persons suffering from dementia evaluate their own situation. Stress is a key variable, however so are the relatives' quality of life, health, care-burden and symptoms of depression when interpreting their assessments (Schiffczyk

et al. 2010, Martyr *et al.* 2014). The quality of the relationship between the person suffering from dementia and the caregiver may also prove consequential (Quinn *et al.* 2009).

Our results are concurrent with other studies examining nutritional statuses of patients with cognitive impairment and dementia (Orisotto *et al.* 2012, Rognstad *et al.* 2013, Roque *et al.* 2013). Roque and colleagues' study (2013), examining a selected group of subjects from memory clinics, found that approximately one-half of their participants was at nutritional risk or undernourished. This occurred more seldom in our study. One explanation might be that the participants in Roque's study (2013) had an average MMSE-value of 15.4 compared to the 23.2 in our study. Our results show association between high cognitive levels (measured by MMSE and Clock Drawing tests) and a good nutritional profile (no registered weight loss and low NUFFE scores). Orisotto *et al.* (2012) also found a significant difference in the nutritional status between patients with no cognitive impairment, patients with mild cognitive impairment, and persons with dementia.

It is concerning that 26.4% of our participants had BMI-values lower than 22 (kg/m²), as this is perceived as undernutrition among the elderly (Helsedirektoratet, 2009). Persons suffering from dementia with BMI-values below 25 experience poorer cognitive and functional performance, and accelerated impairment than do persons with higher BMI-values (Coin *et al.* 2012). The average BMI in our selection was 25.2, 24.9 for those ≥ 65 years old, and 24.8 for the women. Patients with BMI ≥ 25 had less severe dementia and lower occurrence of nutritional risk than those with BMI < 25 (Coin *et al.* 2012). BMI with cut-off at 25 may be useful when identifying frail patients suffering from dementia. The correlation between cognitive impairment and nutritional status is complex and mutually affecting. It is difficult to tell with confidence whether cognitive impairment is a cause or a consequence of worsened nutritional status. Winter *et al.*

(2013) found that one-third of elderly patients at nutritional risk had BMI-values ≥ 25 .

Nutritional screening can most likely identify the development of a negative nutritional profile, as illustrated in this study.

Soto *et al.* (2012) regard weight loss as a frequent complication of Alzheimer's disease and a predictor for accelerated cognitive impairment. Several studies refer to weight loss several years before onset of dementia and rapid worsening at the time of diagnosis (Stewart *et al.* 2005, Knopman *et al.* 2007). In one study, Alzheimer's patients with a mild degree of dementia presented with weight loss more than 4% of their total body weight in one year (Hansen *et al.* 2011). Based on MMSE and Clock Drawing Test measurements, our findings support that weight loss starts before the development of the clinical syndrome. Several persons in our study suffered from mild cognitive impairment or early stage dementia. Nevertheless, 41.8% registered involuntary weight loss. Early neurodegenerative changes may partly explain this phenomenon (Stewart *et al.* 2005). Loss of smell and initiative as well as apathy before dementia might be another factors (Knopman *et al.* 2007).

In line with our results, other studies show that women are more at risk of nutritional failure than are men (Hansen *et al.* 2011, Söderhamn *et al.* 2012, Donini *et al.* 2013, Ramage-Morin & Garriguet, 2013, Rognstad *et al.* 2013). Referred to Hansen and colleagues' study (2011), men living with another person seem to reduce the risk of nutritional decline. Our findings indicate that NUFFE detects the association between living arrangements and nutritional risk. Worsening nutritional status with increasing age is apparent in our and other studies (Söderhamn *et al.* 2012, Rognstad *et al.* 2013, Ramage-Morin & Garriguet 2013). The latter mentioned studies suggest that weight loss and decline in nutritional status should be taken serious from time of discovery, preferably at an early stage of mild cognitive impairment.

Study strengths and weaknesses

We regard as a strength that approximately 69% of patients examined at the memory clinic participated in our study, implying representativeness. Furthermore, the fact that the assessments were performed using well known and psychometrically tested instruments is also considered strength. Because of the criteria of inclusion, the sample includes a particular distribution in terms of living arrangements. Persons not accompanied by relatives arriving to the clinic were excluded. The excluded group may deviate from the sample, however because we wanted to collect data from both patients and relatives this was a clear exclusion criterion in the study. The fact that the nutritional screenings were conducted by the same person may be a weakness, however, it may be strength as the patients all went through the same procedure. Data collected from patients and their relatives were collected separately, which may be beneficial. This is a cross sectional study and thus can't predict what will happen over time. Whether or not better nutritional status can affect levels of function, cognition, quality of life, and the development of disease should be questions for further research. Longitudinal studies seem appropriate.

Conclusion

The study demonstrates that a significant proportion of patients at our memory clinic are in nutritional risk. Considerable comparative results exist between patients' and their relatives' NUFFE scores however the patients assess themselves as somewhat more well-nourished as reported by their relatives. In this study women are more exposed to unfavorable nutrition profile than men and regarding nutritional status it is favorable to live with some. Decreased MMSE scores increase the risk of malnutrition. A MMSE-test and the Clock Drawing Test may predict weight loss

.

Implications for practice

- Self-reporting and proxy-rating seems appropriate when nutritional status should be assessed among cognitive impaired adults in order to obtain knowledge of the patients' insight and relatives' experience of nutrition profile.
- (When screening) It should be clearly stated who is the source of information in clinical settings and research.
- NUFFE seems to be an appropriate instrument for assessing nutritional statuses among cognitive impaired adults.

Contributions

Study design: ALL, SMSH and US designed this study. Collection of data and analyses: ALL and BOM collected all data. ALL extracted data analyses with EKG and SMSH. Manuscript: ALL wrote the manuscript with SMSH, US, BOM, and EKG.

Acknowledgement

Thank you to the patients and their relatives who participated in this study.

The authors declare no conflict of interest.

References

Aagaard H & Grøndahl VA (2013) *Food and meals in the home care; survey performed for the Norwegian Directory of Health Affairs. (In Norwegian).*

Arlt S, Hornung J, Eichenlaub M, Jahn H, Bullinger M & Petersen C (2008) The patient with dementia, the caregiver and the doctor: cognition, depression and quality of life from three perspectives. *International Journal of Geriatric Psychiatry* 23, 604-10.

Bradford A, Brenes GA, Robinson RA, Wilson N, Snow AL, Kunik ME, Calleo J, Petersen NJ, Stanley MA & Amspoker AB (2013) Concordance of self- and proxy-rated worry and anxiety symptoms in older adults with dementia. *Journal of Anxiety Disorders* 27,125-30.
doi: 10.1016/j.janxdis.2012.11.001.

Callen BL (2010) Nutritional screening in community dwelling older adults. *International Journal of Older People Nursing* 6, 272-281. Doi: 10.1111/j.1748-3743.2010.00241.x

Chang CC & Roberts BL (2011) Strategies for Feeding Patients with Dementia. *The American journal of nursing* 111, 36-44. Doi: 10.1097/01.NAJ.0000396553.01996.5e.

Coin A, Bolzetta F, De Rui M, Veronese N, Granziera S, Girardi A, Manzato E & Sergi G (2012) Nutritional and Global Indexes of Progression in Dementia: A 12-Month Prospective Study. *American Journal of Alzheimer's Disease & Other Dementias®* 27, 504-508. DOI: 10.1177/1533317512456451

Donini LM (2013) Malnutrition in elderly: social and economic determinants. *The Journal of nutrition, health & aging* 17, 9 -15.

Faxen IG (2008) Nutrition in dementia - treatment and prevention. *Nordisk Geriatrik* 11, 24-9.

Folstein MF, Folstein SE & McHugh PR (1975) «Mini-Mentale state». A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* 12, 189-198.

Gianluca, M, Carlo, N & Massimiliano, F (2011) Malnutrition in patients with dementia. *Journal of the American Geriatrics Society* 59, 774–775.

DOI: 10.1111/j.1532-5415.2011.03343.x

Guigoz Y (2006) The Mini Nutritional Assessment (MNA) review of the literature – What does it tell us? *Journal of Nutrition Health and Aging* 10, 466-85.

Hansen ML H, Waldorff FB & Waldemar G (2011) Prognostic Factors for Weight Loss Over 1-year Period in Patients Recently Diagnosed With Mild Alzheimer Disease. *Alzheimer Disease & Associated Disorders* 25, 269-275. doi: 10.1097/WAD.0b013e3182096624

Helsedirektoratet. Nasjonale faglige retningslinjer for forebygging og behandling av underernæring, *National guidelines for prevention and treatment of undernutrition (In Norwegian)*, Oslo 2009.

Kaiser MJ, Bauer JM, Ramsch C et al. (2009) The MNA-international group. Validation of the Mini Nutritional Assessment Short-Form (MNA-SF®) A practical tool for identification of nutritional status. *The Journal of Nutrition Health and Aging* 13, 782–788.

Knopman DS, Edland SD, Cha RH, Petersen RC & Rocca WA (2007) Incident dementia in women is preceded by weight loss by at least a decade. *The Official Journal of the American Academy of Neurology* 69, 739-746. 10.1212/01.wnl.0000267661.65586.33

Kvamme JM, Holmen J, Wilsgaard T, Florholmen J, Midthjell K & Jacobsen BK (2012) Body mass index and mortality in elderly men and women: the Tromsø and HUNT studies. *Journal of Epidemiology & Community Health* 66, 611-617. doi: 0.1136/jech.2010.123232

Lukas A, Niederecker T, Günther I, Mayer B & Nikolaus T (2013) Self- and proxy report for the assessment of pain in patients with and without cognitive impairment: experiences gained in a geriatric hospital. *Zeitschrift für Gerontologie + Geriatrie (Z Gerontol Geriatr)* 46, 214-21. doi: 10.1007/s00391-013-0475-y.

Marco J, Barbra R, Zapatero A, Matia P, Plaza S, Losa JE, Canora J & Garcia de Casasola G (2011) Prevalence of the notification of malnutrition in the departments of internal medicine and its prognostic implications. *Clinical Nutrition* 30, 450-454.

Martyr A, Nelis SM, Clare N & Clare L (2014) Predictors of perceived functional ability in early-stage dementia: self-ratings, informant ratings and discrepancy scores. *International Journal of Geriatric Psychiatry* 29. DOI: 10.1002/gps.4071

Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unosson M, Rothenberg E & Irtun Ø (2008) The Scandinavian Nutrition group. Insufficient nutritional knowledge among health care workers? *Clinical Nutrition* 27, 196-202. <http://dx.doi.org/10.1016/j.clnu.2007.10.014>

Orsitto, G (2012) Different components of nutritional status in older inpatients with cognitive impairment. *The Journal of Nutrition, Health & Aging* 16, 468-71.

Quinn C, Clare L & Woods B (2009) The impact of the quality of relationship on the experiences and wellbeing of caregivers of people with dementia: a systematic review. *Aging & Mental Health* 13, 143-54.

Ramage-Morin P & Garriguet, D (2013) Nutritional risk among older Canadians. Statistics Canada, *Catalogue no. 82-003-x Health Reports* 3, 3-13.

<http://search.proquest.com/docview/1353082532/fulltextPDF/142FAD8AE8CB16BE62/1?accountid=32806>

Ranhoff AH & Laake K (1993) The Barthel ADL Index: Scoring by the Physician from Patient Interview is not Reliable. *Aging and Aging* 22, 171-174.

Rognstad M-K, Brekke I, Holm E, Linberg C & Lühr N (2013) *Undernutrition among elderly people with dementia living at home. (In Norwegian). Sykepleien Forskning* 04, 299-307.

Roque M, Salva A & Vellas B (2013) Malnutrition in Community-Dwelling Adults with Dementia (NutriAlz Trial). *The journal of nutrition, health & aging* 17, 295.

Saka B, Kaya O, Ozturk GB, Erten N & Akif Karan M (2010) Malnutrition in the elderly and its relationship with other geriatric syndromes. *Clinical Nutrition* 6, 745-748. Schiffczyk C,

Romero B, Jonas C, Lahmeyer C, Müller F & Riepe MW (2010) Generic quality of life assessment in dementia patients: a prospective cohort study. *BioMedCentral Neurology* 10, 48.

Doi: 10.1186/1471-2377-10-48

Soto ME, Secher M, Gillette-Guyonnet S, van Kan GA, Andrieu S, Nourhashemi F, Rolland Y & Vellas B (2012) Weight loss and rapid cognitive decline in community-dwelling patients with Alzheimer's disease. *Journal of Alzheimer's Disease* 28, 647-654

Doi: 10.3233/JAD-2011-110713

Stewart R, Masaki K, Xue Q-L, Peila R, Petrovitch H, White LR & Launer LJ (2005) A 32-Year Prospective Study of Change in Body Weight and Incident Dementia. The Honolulu-Asia Aging Study. *JAMA Neurology* 62, 55-60. doi:10.1001/archneur.62.1.55.

Strobel C, Johansen H, Wetterberg P & Engedal K (2012) KT-NR. Norsk Revidert Klokketest. *Nasjonalt Kompetansesenter for Aldring og Helse*.

Suominen MH, Sandelin E, Soini H, Pitkala, KH (2009) How well do nurses recognize malnutrition in elderly patients? *European Journal of Clinical Nutrition* 63, 292–296. doi:10.1038/sj.ejcn.1602916

Söderhamn U, Christensson L, Idvall E, Johansson A-K & Bachrach-Lindström M (2012) Factors associated with nutritional risk in 75-year old community living people. *International Journal of Older People Nursing* 20, 2162-2171.

Söderhamn U, Flateland S, Jessen L & Söderhamn O (2009) Norwegian version of the Nutritional Form For the Elderly: sufficient psychometric properties for performing institutional screening of elderly patients. *Nutrition Research* 29, 761–7.

Sørbye LW, Schroll M, Finne SH, Jonsson PV, Topinkova E, Ljunggren G et al. (2008) Unintended Weight Loss in the Elderly Living at Home: the Aged in Home Care Project (AdHOC). *The Journal of Nutrition Health and Aging* 12, 10-6.

Tangvik RJ, Guttormsen AB, Tell GS & Ranhoff AH (2012) Implementation of nutritional guidelines in a university hospital monitored by repeated point prevalence surveys. *European Journal of Clinical Nutrition* 66, 388–393.

Tomstad ST, Söderhamn U, Espnes G A & Söderhamn O (2012) Living alone, receiving help, helplessness, and inactivity are strongly related to risk of undernutrition among older home-dwelling people. *International Journal of General Medicine* 5, 231- 240.

Vogel A, Stokholm J, Gade A, Andersen BB, Hejl A-M & Waldemar, G (2004)

Awareness of deficits in mild cognitive impairment and Alzheimer's disease: do MCI patients have impaired insight? *Dementia and Geriatric Cognitive Disorders* 17,181–187.

DOI:10.1159/000076354

Winter J, Flanagan D & Mcnaughton SA (2013) Nutrition screening of older people in a community general practice, using the MNA-SF. *The journal of nutrition, health & aging* 17, 322-325.

Table 1. Demographic and clinical variables

Demographic variables	Total	Women, n (%)	Men, n (%)	p-value
		113 (53.1)	100 (46.9)	
Age (years)				
Average (SD)	73.1(9.0)	73.5 (8.6)	72.6 (9.5)	0.471
Age < 65, n (%)	32 (15)	15 (46.9)	17 (53.1)	0.570
Age ≥ 65, n (%)	181 (85)	98 (54.1)	83 (45.9)	
Living arrangements				
Lives alone, n (%)	69 (32.4)	57 (82.6)	12 (17.4)	< 0.001
Cohabits, n (%)	144 (67.6)	56 (38.9)	88 (61.1)	
Clinical variables				
Involuntary weight loss				
Yes, n (%)	89 (41.8)	55 (61.8)	34 (38.2)	0.037
No, n (%)	124 (58.2)	58 (46.8)	66 (53.2)	
BMI (kg/m²)				
Average (SD)	25.2 (4.8)	24.8 (5.5)	25.6 (3.7)	0.215
BMI, average, age < 65 (SD)	26.7 (4.3)	25.3 (4.5)	28.0 (3.7)	0.064
BMI, average, age ≥ 65 (SD)	24.9 (4.8)	24.7 (5.7)	25.1 (3.6)	0.590
BMI < 22, n (%)	56 (26.4)	41 (73.2)	15 (26.8)	0.001

BMI \geq 22, n (%)	156 (73.6)	71 (45.5)	85 (54.5)	
NUFFE (scores)				
NUFFE, average, patient-scores (SD)	4.7 (3.1)	5.6 (3.1)	3.8 (3.0)	< 0.001
NUFFE, average, relatives-scores (SD)	5.9 (4.0)	6.7 (4.0)	4.9 (3.7)	0.001
NUFFE < 6, patient-scores, n (%)	143 (67.5)	59 (41.3)	84 (58.7)	< 0.001
NUFFE \geq 6, patient-scores, n (%)	69 (32.5)	54 (78.3)	15 (21.7)	
NUFFE < 6, relatives-scores, n (%)	120 (56.6)	51 (42.5)	69 (57.5)	< 0.001
NUFFE \geq 6, relatives-scores, n (%)	92 (43.4)	62 (67.4)	30 (32.6)	
MMSE (scores)				
Average (SD)	23.2 (4.5)	22.9 (4.6)	23.6 (4.4)	0.252
Average, age < 65	26.6 (3.2)	26.1 (4.2)	27.0 (2.1)	0.423

(SD)				
Average, age ≥ 65 (SD)	22.6 (4.5)	22.4 (4.5)	22.9 (4.4)	0.447
MMSE < 20, n (%)	42 (19.8)	26 (61.9)	16 (38.1)	0.236
MMSE 20 – 26 n (%)	108 (50.9)	58 (53.7)	50 (46.3)	
MMSE ≥ 27 n (%)	62 (29.3)	28 (45.2)	34 (54.8)	
Clock Drawing Test				
Non-approved Clock Drawing Test, n (%)	106 (49.8)	60 (56.6)	46 (43.4)	0.338
Approved Clock Drawing Test, n (%)	107 (50.2)	53 (49.5)	54 (50.5)	

Table 2. Patients' and their relatives' NUFFE-scores divided into risk groups, low risk for undernutrition (A, NUFFE-score < 6) and medium/high risk for undernutrition (B, NUFFE-score \geq 6) in relation to demographic data, involuntary weight loss, BMI, MMSE score, and clock drawing test.

	Group A: NUFFE- score < 6 Patient- score, n = 143 % (67.5)	Group B: NUFFE- score \geq 6 Patient- score, n = 69 % (32.5)	p-value	Group A: NUFFE- score < 6 Relatives- score, n = 120 % (56.6)	Group B: NUFFE- score \geq 6 Relatives- score, n = 92 % (43.4)	p-value
Sex						
Women	59 (41.3)	54 (78.3)	< 0.001	51 (42.5)	62 (67.4)	< 0.001
Men	84 (58.7)	15 (21.7)		69 (57.5)	30 (32.6)	
Age (years)						
< 65	27 (18.9)	4 (5.8)	0.012	26 (21.7)	5 (5.4)	0.001
\geq 65	116 (81.1)	65 (94.2)		94 (78.3)	87 (94.6)	
Living arrangements						
Lives alone	27 (18.9)	42 (60.9)	< 0.001	16 (13.3)	53 (57.6)	< 0.001
Cohabits	116 (81.1)	27 (39.1)		104 (86.7)	39 (42.4)	
Involuntary weight loss						

Yes	42 (29.4)	47 (68.1)	< 0.001	31 (25.8)	58 (63.0)	< 0.001
No	101 (70.6)	22 (31.9)		89 (74.2)	34 (37.0)	
BMI (kg/ m ²)						
< 22	29 (20.3)	27 (39.7)*	0.004	17 (14.2)	39 (42.9) **	< 0.001
≥ 22	114 (79.7)	41 (60.3)*		103 (85.8)	52 (57.1) **	
MMSE (scores)						
< 20	24 (16.9)	18 (26.1)	0.021	15 (12.5)	27 (29.7)	0.002
20 - 26	68 (47.9)	39 (56.5)		61 (50.8)	46 (50.5)	
≥ 27	50 (35.2)	12 (17.4)		44 (36.7)	18 (19.8)	
Clock Drawing Test						
Non-approved	64 (44.8)	42 (60.9)	0.040	53 (44.2)	53 (57.6)	0.071
Approved	79 (55.2)	27 (39.1)		67 (55.8)	39 (42.4)	

Notes:

*Amount of NUFFE patient-scores in group B and measurements of BMI was 68 (n=68 (32.2%))

**Amount of NUFFE relatives-scores in group B and measurements of BMI was (n=91 (43.1%))

Table 3. Patients' weight status, non-registered weight loss, or registered weight loss in relation to demographic data, BMI, MMSE, and clock drawing test.

	No weight loss n = 124. % (58.2)	Involuntary weight loss n = 89. % (41.8)	p-value
Sex			
Women	58 (46.8)	55 (61.8)	0.037
Men	66 (53.2)	34 (38.2)	
Age (years)			
< 65	26 (21.0)	6 (6.7)	0.006
≥ 65	98 (79.0)	83 (93.3)	
Living arrangements			
Lives alone	31 (25.0)	38 (42.7)	0.008
Cohabits	93 (75.0)	51 (57.3)	
BMI (kg/m ²)			
< 22	20 (16.1)	36 (40.9)	< 0.001
≥ 22	104 (83.9)	52 (59.1)	
MMSE (scores)			
< 20	16 (12.9)	26 (29.5)	< 0.001
20-26	61 (49.2)	47 (53.4)	
≥ 27	47 (37.9)	15 (17.1)	
Clock Drawing Test			
Non-approved	52 (41.9)	54 (60.7)	0.008

Approved	72 (58.1)	35 (39.3)	
----------	-----------	-----------	--

Sorlandet Hospital Arendal

The Memory Clinic

Journal of Clinical Nursing

Atten: Editor-in-Chief: Debra Jackson

cs-author@wiley.com

Dear Editor,

Please find enclosed the manuscript 'Nutritional screening of patients at a memory clinic – associations between scoring patients' self-reports and their relatives' scores using the same instrument.' The manuscript presents the associations between demographic factors, cognition and nutrition status in patients with cognitive impairment and dementia. Poor nutrition status is common among cognitive impaired and dementia patients which leaves this patient group vulnerable regarding functional level and health status.. With higher proportion of elderly in the population, detection and treatment of such conditions may be important to prevent further decline in health among these patients. *Journal of Clinical Nursing* covers prevention, treatments and health aspects in the elderly, and we therefore consider this manuscript with focus on nutrition status in cognitive impaired and dementia patients as a worthwhile contribution to that portfolio.

Arendal, May 2014.

Anne Liv Lyngroth

Corresponding author

Author guidelines for *Journal of Clinical Nursing*

1. GENERAL

Please read the guidelines carefully for details on the submission of manuscripts, the journal's requirements and standards as well as information concerning the procedure after a manuscript has been accepted for publication in *JCN*. Authors are encouraged to visit [Wiley Blackwell Author Services](#) for further information on the preparation and submission of articles and figures.

1.1 Essential Criteria

The Editors welcome papers that develop and promote knowledge that is directly relevant to all spheres of clinical practice in nursing and midwifery around the world. Therefore, papers must demonstrate clinical application and international relevance, and make an important and novel contribution to the field. The Editors are also looking for papers which will be widely read and cited, thereby having an impact on nursing knowledge and practice. Manuscripts undergo an initial review by the Editor-in-Chief and the Editors before peer review, to assess whether they meet these essential criteria. There is no process of appeal against rejection at this stage.

1.2 International Relevance

Papers submitted should be relevant to the Aims & Scope of *JCN* and written in a way that makes the relevance of content clear for *JCN*'s international readership. For a discussion of what international relevance means and what makes a paper internationally relevant, please see Watson *et al.*'s editorial on [‘What makes a *JCN* paper international?’](#).

Before submitting your paper, please ensure that:

- a reader in a region or country very different from your own will be able to make sense of everything in your paper;
- you have clearly outlined the relevance of your paper to the subject field internationally and also its transferability into other care settings, cultures or nursing specialities;
- papers exploring focussed cultural or other specific issues have clearly placed the discussions within an international context;
- when you are discussing clinical issues, you have made the relevance to other geographical regions and cultural contexts clear.

Specific requirements to ensure the paper is clearly relevant to an international audience are as follows:

- Country names are only to be included in titles where it is made clear the content is being compared and contrasted to the International arena.
- Ensure that cited sources are available in English.
- Relevant international literature should be cited, so that studies are embedded in the context of global knowledge on the topic.
- Explain any policies, practices and terms that are specific to a particular country or region.

1.3 English Language

JCN manuscripts should be written in good English and the Editor-in-Chief strongly advises authors whose first language is not English to have a native English speaker revise their manuscript prior to submission. All authors are advised to consult the European Association of Science Editors (EASE) website for a copy in their own language of [EASE Guidelines for](#)

Authors and Translators of Scientific Articles to be Published in English. It is preferred that manuscripts are professionally edited. Visit our site to learn about the options. Please note that using the Wiley English Language Editing Service does not guarantee that your paper will be accepted by this journal.

2. ETHICAL GUIDELINES

2.1 Authorship and Acknowledgements

Authorship: *JCN* adheres to the definition of authorship set up by The International Committee of Medical Journal Editors (ICMJE). According to the ICMJE, authorship criteria should be based on 1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, 2) drafting the article or revising it critically for important intellectual content and 3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3.

Acknowledgements: Under Acknowledgements please specify contributors to the article other than the authors accredited. Please also include specifications of the source of funding for the study. Suppliers of materials should be named and their location (town, state/county, country) included.

2.2 Ethical Approval

All studies should include an explicit statement in the Methods section identifying the review and ethics committee approval for each study, if applicable. The Editor-in-Chief reserves the

right to reject papers if there is doubt as to whether appropriate procedures have been used.

2.3 Clinical Trials: should be reported using the CONSORT guidelines. A CONSORT checklist should also be included in the submission material; this and the template for the flow diagram which should be included as a figure in your manuscript can be downloaded from the CONSORT website.

2.4 Conflict of Interest and Source of Funding

Conflict of Interest: It is the responsibility of the authors to disclose to the Editor-in-Chief any significant financial or personal interests they may have in products, technology or methodology mentioned in their manuscript. This information will be deemed confidential and will only be disclosed to manuscript reviewers if, in the opinion of the Editor-in-Chief, the information is directly pertinent for an informed review. A statement regarding conflict of interest should follow the Contributions to the manuscript.

Editors of *JCN* are encouraged to publish in *JCN*. To avoid conflicts of interest, editors do not process their own papers. If a member of the editorial team is submitting to *JCN*, then the ScholarOne system prevents them from viewing any details related to their paper and also prevents the Editor-in-Chief from allocating the paper to them for review, regardless of their place in the authorship of the paper. If the Editor-in-Chief is submitting a paper then the Editorial Assistant is informed and the paper allocated to one of the editors for processing. Editors are also urged to be aware of other potential conflicts of interest such as processing papers by collaborators and colleagues. Such situations are unavoidable but editors are expected to exercise

discretion and fairness regardless of any proximity to submitting authors.

2.5 Permissions

If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the author's responsibility to obtain these in writing and provide copies to the Publishers.

2.6 Copyright Transfer Agreement

If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to login into Author Services; where via the Wiley Author Licensing Service (WALS) they will be able to complete the license agreement on behalf of all authors on the paper.

For authors signing the copyright transfer agreement: If the OnlineOpen option is not selected the corresponding author will be presented with the copyright transfer agreement (CTA) to sign. The terms and conditions of the CTA can be previewed in the samples associated with the Copyright FAQs below:

CTA Terms and Conditions http://authorservices.wiley.com/bauthor/faqs_copyright.asp

For authors choosing OnlineOpen: If the OnlineOpen option is selected the corresponding author will have a choice of the following Creative Commons License Open Access Agreements (OAA):

Creative Commons Attribution Non-Commercial License OAA

Creative Commons Attribution Non-Commercial -NoDerivs License OAA

To preview the terms and conditions of these open access agreements please visit the Copyright FAQs hosted on Wiley Author Services

http://authorservices.wiley.com/bauthor/faqs_copyright.asp and visit

<http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright--License.html>

If you select the OnlineOpen option and your research is funded by The Wellcome Trust and members of the Research Councils UK (RCUK) you will be given the opportunity to publish your article under a CC-BY license supporting you in complying with Wellcome Trust and Research Councils UK requirements. For more information on this policy and the Journal's compliant self-archiving policy please visit: <http://www.wiley.com/go/funderstatement>

For RCUK and Wellcome Trust authors click on the link below to preview the terms and conditions of this license:

Creative Commons Attribution License OAA

To preview the terms and conditions of these open access agreements please visit the Copyright FAQs hosted on Wiley Author Services

http://authorservices.wiley.com/bauthor/faqs_copyright.asp and visit

<http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright--License.html>

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be submitted electronically via <http://mc.manuscriptcentral.com/jcnur>.

Authors may track the status of their own manuscripts. Complete instructions for submitting a

paper are available online and below. Further assistance can be obtained from:

support@scholarone.com.

Full instructions and support for submission are available on the site and a user ID and password can be obtained on the first visit. Support can be contacted by phone: (1 434 817 2040 ext. 167) or by e-mail (support@scholarone.com).

3.1 Getting Started

Go to the journal's online submission site: <http://mc.manuscriptcentral.com/jcnur>. Log-in or click the 'Create Account' option if you are a first-time user

- If you are creating a new account.
 - After clicking on 'Create Account', enter your name and e-mail information and click 'Next'. Your e-mail information is very important.
 - Enter your institution and address information as appropriate, and then click 'Next.'
 - Enter a user ID and password of your choice (we recommend using your e-mail address as your user ID), and then select your area of expertise. Click 'Finish'.

- If you have an account, but have forgotten your log in details, go to Password Help on the journals online submission system and enter your e-mail address. The system will send you an automatic user ID and a new temporary password.

3.2 Submitting Your Manuscript

- After you have logged in, click the 'Submit a Manuscript' link in the menu bar. Enter data and answer questions as appropriate. You may copy and paste directly from your manuscript and you may upload your pre-prepared covering letter.
- Click the 'Next' button on each screen to save your work and advance to the next screen.
- You are required to upload your files.
 - Click on the 'Browse' button and locate the file on your computer.
 - Select the designation of each file in the drop-down menu next to the Browse button.
 - When you have selected all files you wish to upload, click the 'Upload Files' button.
- Review your submission (in HTML and PDF format) before sending to the Journal. Click the 'Submit' button when you are finished reviewing

3.3 Manuscript Files Accepted

All parts of the manuscript must be available in an electronic format and, where possible, the main text, figures and tables should be combined into a single document, with the tables and figures appearing after the reference list. Please note that we are unable to accept any manuscripts uploaded as a PDF file. GIF, JPEG, PICT or Bitmap files are acceptable for submission, but only high-resolution TIF or EPS files are suitable for printing. The text file must contain the entire manuscript including title page, structured abstract, text, references, tables, and figure legends, but no embedded figures. Figure tags should be included in the file.

Full instructions and support for submission are available on the site and a user ID and password can be obtained on the first visit. For help please contact the *JCN* Editorial Assistant, Tara Noonan on +44 (0)1865 476540 or by email: (JCN@wiley.com).

3.4 Blinded Review

All manuscripts submitted to *JCN* will be reviewed by at least two experts in the field. *JCN* uses double-blinded review. The names of the reviewers will thus not be disclosed to the author submitting a paper and the name(s) of the author(s) will not be disclosed to the reviewers. To allow double-blinded review, please submit (upload) your main manuscript and title page as separate files. Please upload:

- Your manuscript without title page under the file designation 'main document'
- The title page, Acknowledgements and Conflict of Interest Statement where applicable, should be uploaded under the file designation 'title page'

3.5 E-mail Confirmation of Submission

After submission you will receive an e-mail to confirm receipt of your manuscript with a manuscript number which you must use in all communications regarding your manuscript. If you do not receive the confirmation e-mail after 24 hours, please check your e-mail address carefully in the system. If the e-mail address is correct please contact your IT department. The error may be caused by spam filtering software on your e-mail server. Also, the e-mails should be received if the IT department adds our e-mail server (uranus.scholarone.com) to their whitelist.

3.6 Manuscript Status

You can check **ScholarOne Manuscripts** any time to see the status of your manuscript. The Journal will inform you by e-mail once a decision has been made

3.7 Submission of Revised Manuscripts

Locate your manuscript under 'Manuscripts with Decisions' and click on 'Submit a Revision' to submit your revised manuscript. Please remember to delete any old files uploaded when you upload your revised manuscript. Please also remember to upload your manuscript document separate from your title page. We do not accept tracked changes for this journal.

4. MANUSCRIPT TYPES ACCEPTED

Please note that quotations are included in the overall word count of articles).

Original Articles: should be between 3,000 - 5,000 words long, double spaced with a wide margin (at least 2cm) on each side of the text. The main text should be structured as follows: Introduction (putting the paper in context - policy, practice or research); Background (literature); Methods (design, data collection and analysis); Results; Discussion; Conclusion; Relevance to clinical practice. The number of words used, excluding abstract, references, tables and figures, should be specified. Pilot studies are not suitable for publication as original articles.

Review Articles: Qualitative and quantitative literature reviews on any area of research relevant to clinical nursing and midwifery are welcomed. Submissions should not exceed 5,000 words, excluding abstract, tables, figures, and reference list. Quotes are included in the overall word count of the main text. Authors are advised to explain their methodology clearly (e.g., overall approach, literature search strategies, data analysis). The PRISMA checklist and flow diagram should be used to guide manuscript development. Systematic review methods are evolving and authors are urged to cite supporting references. The main text should be structured as follows:

Introduction, Aims, Methods, Results, Discussion, Conclusion, and Relevance to Clinical Practice.

Research-in-Brief: This section offers an opportunity to publish preliminary results from studies or parts of studies rapidly where the nature of the content warrants early dissemination or the research would not normally be published. In the case of preliminary results, which may subsequently be published in *JCN* or elsewhere, it is expected that the publication of the RiB will be referred to and fully referenced. The publication of pilot studies is not appropriate. RiB submissions, which should be made via ScholarOne Manuscripts and identified as RiB, are reviewed at the discretion of the Editor-in-Chief.

Research In Brief Articles should be prepared using the following headings: Aims; Background; Design; Methods; Results; Conclusions; Relevance to clinical practice. The RiB must not exceed 1,000 words and only one figure or one table should accompany and a maximum of five references is permitted. Abstracts are not required for this type of paper. Keywords, contributions and a conflict of interest statement should be included. Authors should note that permission should be sought from the Publisher before reproducing any part of the published paper in subsequent publications.

Commentaries and Responses to Commentaries: The Editor-in-Chief welcomes commentaries and Responses to commentaries on papers published in *JCN*. These should be approximately 500 words in length with a maximum of five references (including the original paper) and should offer a critical but constructive perspective on the published paper. All commentaries should be submitted via [ScholarOne Manuscripts](#). Please follow our guidelines when writing a Commentary.

Discursive papers: including position papers and critical reviews of particular bodies of work which do not contain empirical data or use systematic review methods are also welcomed. These should be structured as follows: Aims; Background; Design (stating that it is a position paper or critical review, for example); Method (how the issues were approached); Conclusions, Relevance to clinical practice.

5. MANUSCRIPT FORMAT AND STRUCTURE

5.1 Structure

All manuscripts submitted to JCN should include a covering letter stating on behalf of all the authors that the work has not been published and is not being considered for publication elsewhere. If the study that is being submitted is similar in any way to another study previously submitted/published or is part of multiple studies on the same topic, a brief sentence explaining how the manuscript differs and that there is no identical material should be stated in the cover letter upon submission.

No identifying details of the authors or their institutions must appear in the manuscript; author details must only appear on the title page and will be entered separately as part of the online submission process.

Title Page: (needed for all manuscript types) must contain both a descriptive and concise title of the paper; names and qualifications of all authors; affiliations and full mailing address, including e-mail addresses, fax and a contact telephone number. The title page must also contain details of the source(s) of support in the form of grants, equipment, drugs or all of these.

Structured Abstract: (not needed for Research In Brief articles or Commentaries) should not exceed 300 words and should accurately reflect the content of the paper. The abstract should not include references or abbreviations and should be provided under the headings: Aims and objectives; Background (stating what is already known about this topic); Design; Methods (for both qualitative and quantitative studies state n); Results (do not report p values, confidence intervals and other statistical parameters); Conclusions (stating what this study adds to the topic); Relevance to clinical practice; Keywords. (Please note that you are asked to add your abstract and keywords into a box when submitting your paper, but both abstract and set of keywords should also appear at the beginning of your actual manuscript - main document) file.

Summary box: (needed for all manuscript types) should contain 2-3 bullet points under the heading 'What does this paper contribute to the wider global clinical community?'

Keywords: (needed for all manuscript types) the keywords that need to be entered within your manuscript (up to 10), are words associated with the paper, which will allow it to be easily cited after acceptance. These are different from the keywords chosen from a list during the submission process; these keywords are to assist the Editors in searching for reviewers to review the manuscript.

Headings and Sub Headings: (needed for all manuscript types): please present headings in the manuscript in bold capitals, sub-headings in lower-case and bold, and subsequent headings in italics.

5.2 Optimizing Your Abstract for Search Engines

Many students and researchers looking for information online will use search engines such as

Google, Yahoo or similar. By optimising your article for search engines, you will increase the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in another work. We have compiled these guidelines to enable you to maximize the web-friendliness of the most public part of your article.

5.3 Statistics

The advice of a statistician should always be sought for quantitative studies, and this person should be acknowledged in the acknowledgement section if the paper is accepted for publication. Where other than simple descriptive statistics are used, a statistician should be included as one of the authors or identified as such when submitting the paper. Please also refer to our statistical guidelines.

5.4 References

The editor and publisher recommend that citation of online published papers and other material should be done via a DOI (digital object identifier), which all reputable online published material should have – see www.doi.org for more information. If an author cites anything which does not have a DOI they run the risk of the cited material not being traceable.

We recommend the use of a tool such as Reference Manager for reference management and formatting.

References within the text should cite the authors' names followed by the date of publication, in chronological date order, e.g. (Lewis 1975, Barnett 1992, Chalmers 1994). Where there are more than two authors, the first author's name followed by *et al.* will suffice, e.g. (Barder *et al.* 1994), but all authors should be cited in the reference list. '*et al.*' should be presented in italics followed

by a full stop only. Page numbers should be given in the text for all quotations, e.g. (Chalmers 1994, p. 7). All references should be cited from primary sources.

Where more than one reference is being cited in the same pair of brackets the reference should be separated by a comma; authors and dates should not be separated by a comma, thus (Smith 1970, Jones 1980). Where there are two authors being cited in brackets then they should be joined by an '&', thus (Smith & Jones 1975).

When a paper is cited, the reference list should include authors' surnames and initials, date of publication, title of paper, name of journal in full (not abbreviated), volume number, and first and last page numbers. Example: Watson R, Hoogbruin AL, Rumeu C, Beunza M, Barbarin B, MacDonald J & McReady T (2003) Differences and similarities in the perception of caring between Spanish and United Kingdom nurses. *Journal of Clinical Nursing* **12**, 85-92.

When a book is cited, the title should be stated, followed by the publisher and town, county/state (and country if necessary) of publication. Example: Smith GD & Watson R (2004) *Gastroenterology for Nurses*. Blackwell Science, Oxford.

Where the reference relates to a chapter in an edited book, details of author and editors should be given as well as publisher, place of publication, and first and last page numbers. Example: Chalmers KI (1994) Searching for health needs: the work of health visiting. In *Research and its Application* (Smith JP ed.), Blackwell Science, Oxford, pp. 143-165.

The edition (where appropriate) of all books should be identified, e.g. 2nd edn. References stated as being 'in press' must have been accepted for publication and a letter of proof from the relevant journal must accompany the final accepted manuscript. Please provide access details for online

references where possible: Example: Lynaugh JE (1997) The International Council of Nurses is Almost 100 years old. University of Pennsylvania, PA. Available at: <http://www.nursing.upenn.edu/history/Chronicle/F97/icn.htm> (accessed 12 December 2002). The reference list should be prepared on a separate sheet and be in alphabetical order and chronological order by first authors' surnames.

5.5 Tables, Figures and Figure Legends

Preparation of Electronic Figures for Publication: Although low quality images are adequate for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented programmes. Scans (TIFF only) should have a resolution of at least 300 dpi (halftone) or 600 to 1200 dpi (line drawings) in relation to the reproduction size (see below). Please submit the data for figures in black and white or submit a Colour Work Agreement Form (see Colour Charges below). EPS files should be saved with fonts embedded (and with a TIFF preview if possible).

For scanned images, the scanning resolution (at final image size) should be as follows to ensure good reproduction: line art: >600 dpi; halftones (including gel photographs): >300 dpi; figures containing both halftone and line images: >600 dpi.

Always include a citation in the text for each figure and table. Artwork should be submitted online in electronic form. Detailed information on our digital illustration standards is available on the [Wiley Blackwell website](#).

Permissions: If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the author's responsibility to obtain these in writing and provide copies to the Publisher.

Colour Charges: It is the policy of *JCN* for authors to pay the full cost for the reproduction of their colour artwork. Therefore, please note that if there is colour artwork in your manuscript when it is accepted for publication, Wiley Blackwell require you to complete and return a Colour Work Agreement Form before your paper can be published. Any article received by Wiley Blackwell with colour work will not be published until the form has been returned. Please return all original hard-copy forms to:

The Production Editor

Journal of Clinical Nursing

Journal Content Management

Wiley Blackwell

Wiley Services Singapore Pte Ltd

1 Fusionopolis Walk

#07-01

Solaris South Tower

Singapore 138628

Note to NIH Grantees: Pursuant to NIH mandate, Wiley Blackwell will post the accepted version of contributions authored by NIH grant-holders to PubMed Central upon acceptance. This accepted version will be made publicly available 12 months after publication. For further information, see NIH Public Access Mandate.

6. AFTER ACCEPTANCE

Upon acceptance of a paper for publication, the manuscript will be forwarded to the Production Editor who is responsible for the production of the journal. In accepting your paper, both *JCN* and Wiley Blackwell give no commitment about date of publication. Therefore, while we can inform you of a likely date in the event of an enquiry, we are unable to accommodate individual requests to have papers published at a particular time to coincide with, for example, the requirements of grant awarding bodies or promotion boards.

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website. A working e-mail address must therefore be provided for the corresponding author. The proof can be downloaded as a PDF (portable document format) file from this site.

Acrobat Reader will be required in order to read this file. This software can be downloaded (free of charge) from the [Adobe website](#). This will enable the file to be opened, read on screen, and any corrections to be added in. Further instructions will be sent with the proof. Hard copy proofs will be posted if no e-mail address is available; in your absence, please arrange for a colleague to access your e-mail to retrieve the proofs.

6.2 Early View (Publication Prior to Print)

JCN is covered by Wiley Blackwell's Early View service. Early View articles are complete full-text articles published online in advance of their publication in a printed issue. Early View articles are complete and final. They have been fully reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final

form, no changes can be made after online publication. Early View articles are given a Digital Object Identifier (DOI), which allows the article to be cited and tracked before allocation to an issue. After print publication, the DOI remains valid and can continue to be used to cite and access the article.

The Editor will decide on the time of publication and retain the right to modify the style of a contribution; major changes will be agreed with the author(s) before production of proofs.

6.3 Author Services

Online production tracking is available for your article through Wiley Blackwell's Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The author will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript. Visit Wiley Blackwell Author Services for more details on online production tracking and for a wealth of resources including FAQs and tips on article preparation, submission and more. For more substantial information on the services provided for authors, please see Wiley Blackwell Author Services.

6.4 Author Material Archive Policy

Please note that unless specifically requested, Blackwell Publishing will dispose of all hardcopy or electronic material submitted two months after publication. If you require the return of any material submitted, please inform the editorial office or production editor as soon as possible.

6.5 Offprints and Extra Copies

A PDF offprint of the online published article will be provided free of charge to the corresponding author, and may be distributed subject to the Publisher's terms and conditions.

Additional paper offprints may be ordered online. Please click on the following link, fill in the necessary details and ensure that you type information in all of the required fields:

<http://offprint.cosprinters.com/cos>

If you have queries about offprints please e-mail offprint@cosprinters.com

7. ONLINE OPEN

OnlineOpen is available to authors of primary research articles who wish to make their article available to non-subscribers on publication, or whose funding agency requires grantees to archive the final version of their article. With OnlineOpen, the author, the author's funding agency, or the author's institution pays a fee to ensure that the article is made available to non-subscribers upon publication via Wiley Online Library, as well as deposited in the funding agency's preferred archive. For the full list of terms and conditions, see

http://wileyonlinelibrary.com/onlineopen#OnlineOpen_Terms

Any authors wishing to send their paper OnlineOpen will be required to complete the payment form available from our website at: <https://onlinelibrary.wiley.com/onlineOpenOrder>

Prior to acceptance there is no requirement to inform an Editorial Office that you intend to publish your paper OnlineOpen if you do not wish to. All OnlineOpen articles are treated in the same way as any other article. They go through the journal's standard peer-review process and will be accepted or rejected based on their own merit.