# Poor appetite is associated with six month mortality in hospitalised older men and women.

Natalie J Cox 1,2, Stephen ER Lim1, Fiona Howson3, Helen Moyses2, Kinda Ibrahim1, Avan A Sayer4,5, Helen C Roberts1,2,6, Sian M Robinson4,5.

1 Academic Geriatric Medicine, Faculty of Medicine, University of Southampton, Tremona Road, Southampton, UK

2 NIHR Southampton Biomedical Research Centre, University of Southampton and University Hospital Southampton NHS Foundation Trust, Southampton, UK

3 Medicine for Older People, University Hospital Southampton NHS Foundation Trust, Southampton, UK

4 AGE Research Group, Translational and Clinical Research Institute, Newcastle University, Newcastle upon Tyne, UK

5 NIHR Newcastle Biomedical Research Centre, Newcastle upon Tyne Hospitals NHS Foundation Trust and Newcastle University, Newcastle upon Tyne, UK

6 NIHR Applied Research Collaborative (ARC) Wessex, University of Southampton, Southampton, UK

## Abstract

### Objectives

Appetite loss is common in hospitalised older individuals but not routinely assessed. Poor appetite in hospital has previously been identified as predictive of greater mortality in the six months following discharge in a single study of female patients. The present study aimed to assess this association in a larger sample including both hospitalised men and women.

### Design

Longitudinal observational study with six month follow up.

### Setting

Acute hospital wards in a single large hospital in England.

### Participants

Older inpatients aged over 70 years.

### Measurements

Appetite was assessed using the Simplified Nutritional Appetite Questionnaire (SNAQ) during hospital stay. Deaths during six month follow-up period were recorded. Association between SNAQ score during hospital admission and death 6 months post-discharge was assessed using binary logistic regression in unadjusted and adjusted analysis.

### Results

296 participants (43% female, mean age 83 years (SD 6.9)) were included in this study. Prevalence of poor appetite (SNAQ score <14) was 41%. In unadjusted analysis a SNAQ score of <14 was associated with a 2.47 increase in odds of mortality at six months (OR 2.47 (95% CI 1.27,4.82)). This association remained after adjusting for number of comorbidities (Charlson index), length of stay and gender (OR 2.62 (95% CI 1.30, 5.27)). In unadjusted continuous analysis, every one point decrease in SNAQ score led to a 1.20 fold increase in odds of mortality at six months (OR 1.20 (95% CI 1.06-1.36)). This association remained in adjusted analysis (OR 1.22 (95% CI 1.07-1.39)).

### Conclusion

Poor appetite is common in hospitalised older people. We have confirmed the association, previously reported in older women, between poor appetite during hospital stay and greater mortality at six months post-discharge but in a larger study including older men and women. Further research is needed to understand the mechanisms of poor appetite, which lead to increased mortality.

## Key Words

Appetite, Older people, Mortality, Nutrition, Hospitalised

## Introduction

Appetite loss amongst older individuals is common. Often this is related to medical conditions and their treatment, but can also be as a result of multifactorial age-related effects [1]: the anorexia of ageing [2]. The anorexia of ageing has been identified as a key determinant of frailty, sarcopenia and disability but remains under recognised [3, 4]. Appetite loss has been shown to be present in over 20% of community dwelling older people [5, 6], rising in acute care with estimates ranging between 30% and 60% [7-12]. Older individuals with poor appetite during hospital admission have greater rates of nosocomial infection and an altered eating pattern, particularly with a reduction in dietary protein intake [7, 10]. There is also evidence of functional impact post-hospital discharge, such as reduction in muscle strength [9], which may reflect lower dietary protein intake.

We have previously reported findings from a longitudinal study that poor appetite in 179 hospitalised older women was predictive of mortality over six months [10]. Appetite was assessed using the Simplified Nutritional Appetite Questionnaire (SNAQ) [13]. A SNAQ score of <14 (indicative of poor appetite) was associated with over twice as many deaths in the six month period post hospital discharge [10]. However, the findings of this single study were limited by an all-female population and small sample size. In the present study we address these limitations; we report on the association between poor appetite in hospitalised older people and mortality at six months post hospital discharge in a larger sample that included both men and women.

## Methods

### Study population

Data from two studies of hospital patients (carried out between 2014 and 2017 in the same hospital departments), that evaluated the impact of volunteer assistance at mealtimes [14] and with mobility [15], were combined. These studies had comparable minimum data sets and data collection methods; *full details of the studies can be found in reports by Howson et al* [14]*, and Lim et al* [15]. In both studies, participants were aged over 70 years and had been admitted (non-electively) to acute wards within one large hospital in England.

### Demographics and participant characterisation

Participant demographics were recorded on hospital admission including age, gender and usual residence (own home, sheltered accommodation and care home). Functional ability in activities of daily living was assessed by the Barthel Index, which gives a score of 1-100, a higher score reflecting greater functional ability [16]. Medical conditions were recorded and used to calculate a Charlson co-morbidity index score, which is predictive of ten year survival [17]. The number of medications on admission were also recorded. Frailty was assessed using the FRAIL scale, which categorises the states of robust, pre-frail and frail [18]. Grip strength, with pre-defined cut offs of <16kg for women and <27kg for men [19], were used to identify probable sarcopenia [20]. Nutritional markers included body mass index (BMI) and nutritional risk, from screening with the Malnutrition Universal Screening Tool (MUST), which categorises individuals as at low, medium or high risk of malnutrition. Length of hospital stay was recorded on discharge.

### Appetite assessment

Appetite was assessed using SNAQ during hospital stay [13]. This is a 4 item questionnaire with statements that cover aspects of appetite and eating, such as ‘my appetite is’ with Likert responses such as ‘very poor, poor, average, good, very good’. The total score is out of 20 and a score of <14 in those aged >65 years is indicative of poor appetite [13].

### Mortality assessment

Participants were followed up on the hospital electronic patient administration system at 6 months post discharge. All deaths up to six months were recorded as a binary outcome.

### Statistical Analysis

Data from the two studies were combined and analysed using SPSS (SPSS IBM Corp version 24). The relationship between SNAQ score during hospital admission and mortality at 6 months was assessed using binary logistic regression in unadjusted and adjusted analyses. This analysis was performed using the SNAQ category of <14 to indicate poor appetite, and also with SNAQ as a continuous variable. The factors considered in the adjusted model were based on our previous study [10], and included length of stay, comorbidity index and gender.

## Results

301 participants were included in the two studies and SNAQ data was available for 296 (98%). The sample included individuals predominantly admitted from their own home (94%), with a mean age of 83 years (SD 6.9); 43% were female. The characteristics of the participants are summarised in Table 1. Participants were mostly pre-frail (median FRAIL scale 2 (IQR 1,3)), multi-morbid population (median Charlson index 6 (IQR 4,7)) with polypharmacy (median medications 8 (IQR 6,11)) and probable sarcopenia (median grip strength 14kg (IQR 10,18) for women, 24 kg (IQR 21,29) for men) with low level functional dependency (median Barthel index 84 (IQR 68,97)). They were considered at low nutritional risk (80%) and had a median BMI of 25 (IQR 21,28).

The prevalence of poor appetite (SNAQ <14) amongst these hospitalised older people was 41%, and of those with poor appetite 49% were female.

At 6 month follow up 42 patients (14%) were deceased, 11 of whom (26%) were female.

In unadjusted analysis, a SNAQ score of <14 was associated with a 2.47 increase in odds of mortality at six month follow up (OR 2.47 (95% CI 1.27,4.82) Table 2). This association remained after adjusting for number of comorbidities (Charlson index), length of stay and gender (OR 2.62 (95% CI 1.30, 5.27) Table 2). As age was not associated with mortality in unadjusted analysis (OR 1.01 (95% CI 0.96, 1.06)) it was not included in the adjusted model.

In unadjusted continuous analysis every one point decrease in SNAQ score lead to a 1.20 fold increase in odds of mortality at six months (OR 1.20 (95% CI 1.06, 1.36) Table 2). This association remained in adjusted analysis (OR 1.22 (95% CI 1.07, 1.39) Table 2).

## Discussion

In this study we assessed the association between poor appetite during hospital stay and mortality at six months in a sample that included older men and women. Our findings confirm our previous report [10], of an association between poor appetite in hospital and greater mortality at six months post hospital discharge. However, the present report adds important new evidence, with this finding now demonstrated in a larger sample that included both older men and women, making the results more generalizable.

In our previous report a SNAQ score of <14 was associated with over twice as many deaths in the six months post hospital discharge (Hazard Ratio 2.29) [10]. In this analysis a score of <14 on the SNAQ was associated with a 2.47 fold increase in odds of mortality at six month follow up. Both studies highlight the utility of appetite assessment using the SNAQ tool, with a low score, indicative of poor appetite, linked to sizeable differences in mortality. Additionally, in this study we have used SNAQ in continuous analysis and have shown that every one point decrease in SNAQ score leads to a 1.20 fold increase in odds of mortality at 6 month follow up. This shows that even reductions in appetite above the defined cut off for a poor appetite (SNAQ <14) [13], are associated with greater mortality.

The prevalence of poor appetite in this sample was 41%, which sits within other estimates for hospitalised older individuals [7-12], and close to the previous study from older women at this UK hospital of 42% [10]. These findings highlight the importance of assessing appetite in hospitalised older people as poor appetite is common. Establishing a unified approach to assessing appetite in older people in a clinical context is needed. We have demonstrated a high response rate to the simple 4-item SNAQ in this sample of hospitalised older people with a completion rate over 98%, which would indicate its utility in clinical practice.

Screening for poor appetite may be a useful approach to recognise individuals at risk of adverse health outcomes including our finding of greater mortality, who may not otherwise be identified by established nutritional screening tools (this population were predominantly categorised as low nutritional-risk), and when other measures of mortality risk such as the Charlson index, may be challenging to calculate in the clinical setting.

Further research is needed to understand the mechanisms of poor appetite which lead to worse healthcare outcomes. Weight loss and subsequent malnutrition is a recognised consequence of appetite loss [13, 21]. However adverse health outcomes, such as sarcopenia and disability, have been identified in those with anorexia of ageing independent of nutritional health indices including BMI and weight loss [22, 23], this aligns with our findings of increased mortality in this population however we were not able to assess weight loss. Factors such as specific micronutrient deficiencies may also constitute potentially-modifiable mechanisms for poor health outcomes associated with low appetite [22].

### Study limitations

This was a secondary data analysis on a combined dataset of two studies drawn from the same population, which used identical data collection methods over a three year period. This study has confirmed previously reported findings of an association between poor appetite in hospital and greater mortality but this is still limited to a population in southern England which is likely to represent a ‘better functioning’ set of hospitalised older people (as indicated by the Barthel index) so may underestimate prevalence of poor appetite, with implications for understanding the impact of its effects. The studies also excluded inpatients with dementia, a sub-population who may be at greater risk of anorexia. Other approaches, such as using oral intake or other proxy measures for appetite may be useful methods for studying this sub-population.

## Conclusions

We have confirmed an association between poor appetite during hospital admission and greater mortality during the six months following hospital discharge in older men and women. Poor appetite was common (41%), in line with other estimates of hospitalised older individuals, and was associated with over twice the odds of mortality at six months independent of comorbidity, gender and length of hospital stay. Appetite was assessed using the SNAQ, a simple tool feasible to administer in the acute setting, which has important potential for use in clinical practice. Further research is needed to understand the mechanisms of poor appetite which lead to increased mortality.

## Author Contributions

Conceptualization and Methodology- N.J.C, H.M, K.I., H.C.R and S.M.R, Data Collection- S.E.R.L, F.H, Formal Analysis- N.J.C, H.M; Writing Original draft preparation- N.J.C Writing review & editing- All Authors, Supervision- A.A.S, H.C.R and S.M.R.

## Funding

The National Institute for Health Research (NIHR) funded this research. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care. N.J.C, H.C.R and H.M receive support from the NIHR Southampton Biomedical Research Centre. S.M.R and A.A.S receive support from the NIHR Newcastle Biomedical Research Centre. H.C.R receives support from the NIHR Applied Research Collaborative (ARC) Wessex. N.J.C has received support and S.E.R.L is supported by the NIHR Clinical Academic Training Scheme. The studies reported in this secondary data analysis were funded by the NIHR Collaboration for Leadership in Applied Health Research and Care (CLAHRC) Wessex.

## Conflict of Interest

The authors declare no conflict of interest.

**Table 1:** Population Characteristics

|  |  |
| --- | --- |
| **Variable** | **Median (IQR)** |
| **Total (n=296)** | **Males (n=169)** | **Females (n=127)** |
| Age\* | 82.7 (6.9) | 82.5 (6.7) | 82.9 (7.3) |
| Usual residence prior to admission$ Own home  Sheltered accommodation Care home | 278 (93.9)9 (3.0)9 (3.0) | 161 (95.3)4 (2.4)4 (2.4) | 117 (92.1)5 (3.9)5 (3.9) |
| Barthel Index | 84 (68,97) | 88 (70,100) | 79 (63,92) |
| Charlson Index | 6 (4,7) | 6 (5,8) | 5 (4,8) |
| Number of medications | 8 (6,11) | 8 (6,11) | 8 (6,11) |
| FRAIL scale | 2 (1,3) | 2 (1,3) | 2 (1,3) |
| Grip strength (kg) | 20 (14,26) | 24 (19, 30) | 14 (10,18) |
| Simplified Nutritional Appetite Questionnaire\* | 13.8 (2.6) | 14.1 (2.5) | 13.5 (2.6) |
| Body Mass Index | 25 (21,28) | 25 (22,27) | 25 (21,29) |
| Malnutrition Universal Screening Tool$ Low risk Medium risk High Risk | 228 (80.0)28 (9.8)29 (10.18) | 129 (79.6)16 (9.9)17 (10.49) | 99 (77.95)12 (9.45)12 (9.45) |
| Length of stay (days) | 12 (6,21) | 12 (6,20) | 12.5 (6,22) |
| Deceased at 6 month follow up$ | 42 (14) | 31 (18) | 11 (8.6) |

**\*Reported as mean (standard deviation), $Reported as frequency (percent)**

**Table 2.** Unadjusted and Adjusted Odds Ratios for Mortality Six Months Post Hospital Discharge

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Unadjusted OR****(95% CI)** | **P**  | **Adjusted OR** **(95% CI)** | **P** | **Adjusted OR** **(95% CI)** | **P** |
| SNAQ (per point decrease in score) | 1.20 (1.06,1.36) | .004 | 1.22 (1.07, 1.39) | .002 |  |  |
| SNAQ score <14 | 2.47 (1.27, 4.82) | .008 |  |  | 2.62 (1.30, 5.27) | .007 |
| Charlson (per point increase) | 1.25 (1.10, 1.44) | .001 | 1.23 (1.065, 1.42) | .005 | 1.22 (1.06, 1.41) | .006 |
| Length of stay (per day increase) | 1.02 (1.01, 1.04) | .012 | 1.02 (1.00, 1.04) | .021 | 1.02 (1.00, 1.04) | .019 |
| Female gender | .42 (.20, .88) | .021 | .41 (.19, .84) | .023 | .423 (.20, .91) | .028 |

## References

1. Cox NJ, Morrison L, Ibrahim K, Robinson SM, Sayer AA, Roberts HC: **New horizons in appetite and the anorexia of ageing**. *Age Ageing* 2020(afaa014).

2. Morley JE, Silver AJ: **Anorexia in the elderly**. *Neurobiology of Aging* 1988, **9**(1):9-16.

3. Morley JE: **Anorexia of aging: a true geriatric syndrome**. *The journal of nutrition, health & aging* 2012, **16**(5):422-425.

4. Morley JE: **Anorexia of ageing: a key component in the pathogenesis of both sarcopenia and cachexia**. *Journal of Cachexia, Sarcopenia and Muscle* 2017, **8**(4):523-526.

5. Hung Y, Wijnhoven HAH, Visser M, Verbeke W: **Appetite and Protein Intake Strata of Older Adults in the European Union: Socio-Demographic and Health Characteristics, Diet-Related and Physical Activity Behaviours**. *Nutrients* 2019, **11**(4):777.

6. van der Meij BS, Wijnhoven HAH, Lee JS, Houston DK, Hue T, Harris TB, Kritchevsky SB, Newman AB, Visser M: **Poor Appetite and Dietary Intake in Community-Dwelling Older Adults**. *Journal of the American Geriatrics Society* 2017, **65**(10):2190-2197.

7. Donini LM, Savina C, Piredda M, Cucinotta D, Fiorito A, Inelmen EM, Sergi G, Dominguez LJ, Barbagallo M, Cannella C: **Senile anorexia in acute-ward and rehabilitation settings**. *The Journal of Nutrition Health and Aging* 2008, **12**(8):511-517.

8. Mudge AM, Ross LJ, Young AM, Isenring EA, Banks MD: **Helping understand nutritional gaps in the elderly (HUNGER): a prospective study of patient factors associated with inadequate nutritional intake in older medical inpatients**. *Clin Nutr* 2011, **30**(3):320-325.

9. Carliene van D, Michael T, Jesse JA, Lucienne AR, Rosanne van S, Marike van der S, Martin van der E, Raoul HHE, Jos WRT, Jos AB *et al*: **Decreased Appetite is Associated with Sarcopenia-Related Outcomes in Acute Hospitalized Older Adults**. *Nutrients* 2019(4):932.

10. Pilgrim AL, Baylis D, Jameson KA, Cooper C, Sayer AA, Robinson SM, Roberts HC: **Measuring Appetite with the Simplified Nutritional Appetite Questionnaire Identifies Hospitalised Older People at Risk of Worse Health Outcomes**. *Journal of Nutrition Health and Aging* 2016, **20**(1):3-7.

11. Dent E, Chapman I, Piantadosi C, Visvanathan R: **Nutritional screening tools and anthropometric measures associate with hospital discharge outcomes in older people**. *Australas J Ageing* 2015, **34**(1):E1-6.

12. Bell SP, Vasilevskis EE, Saraf AA, Jacobsen JM, Kripalani S, Mixon AS, Schnelle JF, Simmons SF: **Geriatric Syndromes in Hospitalized Older Adults Discharged to Skilled Nursing Facilities**. *Journal of the American Geriatrics Society* 2016, **64**(4):715-722.

13. Wilson MM, Thomas DR, Rubenstein LZ, Chibnall JT, Anderson S, Baxi A, Diebold MR, Morley JE: **Appetite assessment: simple appetite questionnaire predicts weight loss in community-dwelling adults and nursing home residents**. *American Journal of Clinical Nutrition* 2005, **82**(5):1074-1081.

14. Howson FFA RS, Lin SX, Orlando R, Cooper C, Sayer AA, Roberts HC: **Can Trained Volunteers Improve the Mealtime Care of Older Hospital Patients? An Implementation Study in One English Hospital**. *BMJ Open* 2018, **8**(e022285).

15. Lim S, Ibrahim K, Dodds R, Purkis A, Baxter M, Rogers A, Sayer AA, Roberts HC: **Physical activity in hospitalised older people: the feasibility and acceptability of a volunteer-led mobility intervention in the SoMoVe study**. *Age Ageing* 2019.

16. Mahoney FI, Barthel DW: **FUNCTIONAL EVALUATION: THE BARTHEL INDEX**. *Maryland state medical journal* 1965, **14**:61-65.

17. Charlson M, Szatrowski TP, Peterson J, Gold J: **Validation of a combined comorbidity index**. *Journal of Clinical Epidemiology* 1994, **47**(11):1245-1251.

18. Morley JE, Malmstrom TK, Miller DK: **A simple frailty questionnaire (FRAIL) predicts outcomes in middle aged African Americans**. *The journal of nutrition, health & aging* 2012, **16**(7):601-608.

19. Dodds RM, Syddall HE, Cooper R, Benzeval M, Deary IJ, Dennison EM, Der G, Gale CR, Inskip HM, Jagger C *et al*: **Grip strength across the life course: normative data from twelve British studies**. *PLoS One* 2014, **9**(12):e113637.

20. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, Cooper C, Landi F, Rolland Y, Sayer AA *et al*: **Sarcopenia: revised European consensus on definition and diagnosis**. *Age and Ageing* 2019, **48**(1):16-31.

21. Schilp J, Wijnhoven HAH, Deeg DJH, Visser M: **Early determinants for the development of undernutrition in an older general population: Longitudinal Aging Study Amsterdam**. *British Journal of Nutrition* 2011, **106**(5):708-717.

22. Landi F, Liperoti R, Russo A, Giovannini S, Tosato M, Barillaro C, Capoluongo E, Bernabei R, Onder G: **Association of anorexia with sarcopenia in a community-dwelling elderly population: results from the ilSIRENTE study**. *European Journal of Nutrition* 2013, **52**(3):1261-1268.

23. Tsutsumimoto K, Doi T, Makizako H, Hotta R, Nakakubo S, Makino K, Suzuki T, Shimada H: **Aging-related anorexia and its association with disability and frailty**. *Journal of Cachexia, Sarcopenia and Muscle* 2018, **9**(5):834-843.