Title: Research identified variation in nutrition practice by community prescribing dietitians with regards to the identification and management of malnutrition amongst community dwelling adults

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Abbreviations

BAPEN; British Association for Parenteral and Enteral Nutrition

BMI; Body mass index

CG; clinical guideline

GP; general practitioner

MUST; Malnutrition Universal Screening Tool

NHS; National Health Service

NICE; National Institute for Health and Care Excellence

ONS; Oral nutritional supplement

OPEN; Older People's Essential Nutrition (OPEN)

WAHSN; Wessex Academic Health Science Network

Abstract

To improve nutritional outcomes of community dwelling adults with malnutrition we identified three related hypotheses to be tested: i) Southampton Community Prescribing Support Service dietitians achieve 100% compliance with selected standards of the National Institute for Health and Clinical Excellence Clinical Guideline (CG) 32, ii) patient service satisfaction among community dwelling adults accessing the prescribing support service is high (90%), and iii) nationally, dietitians use weight gain goal >10% and BMI >18.5 kg/m^2 as outcome measures from the service phases of prescribing support. A retrospective audit of records of 100 community-dwelling adults accessing local services considered CG32 "Indications for nutrition support in hospital and community standard 1.3.1" and CG32 "Monitoring of nutrition support in hospital and community standard 1.5.6". A questionnaire was distributed to community-dwelling adults (n=52) accessing the service, in addition to a national survey of dietetic practice. Compliance with standard 1.3.1 was 46% and with standard 1.5.6 it was 82%. The majority of patients (86%; n=13) reported satisfaction with the support service. Nationally, 89% (n=51) of dietitians use weight and 87% (n=50) use BMI as an outcome measure for success of nutritional intervention. All research hypotheses were rejected. These results suggest there is considerable variation in the identification and management of malnutrition amongst community dwelling adults, which may impact on clinical and nutritional outcomes. Future work should consider quality improvement projects to address potential barriers to achieving best practice by community prescribing dietitians through the use of nutrition pathways to support older adults with malnutrition.

Keywords: malnutrition, oral nutrition support, community dwelling adults, prescribing support, dietitian

1. Introduction

Malnutrition can be defined using anthropometrical cut-offs such as a body mass index (BMI) ≤ 18.5 kg/m^2, unintentional weight loss of > 10% within the last 3-6 months or BMI < 20 kg/m^2 combined with unintentional weight loss of > 5% in the last 3-6 months [1]. There are several consequences of malnutrition, including increased risk of developing pressure sores, more frequent falls, reduced immune function and increased risk of infection, general weakness, low mood and a loss of independence [2-3]. In the United Kingdom (UK) there are approximately 1.3 million community dwelling older people (aged ≥ 65 years) classified as malnourished [4] and malnutrition is estimated to cost the National Health Service (NHS) across the UK £30.7 billion per annum [5].

Nutritional management of malnutrition includes food fortification or the use of oral nutritional supplements (ONS) [6]. The use of ONS for 12 weeks in adults living in residential care has been shown to result in significant weight gain and improved quality of life in patients found to be at medium or high risk of malnutrition, according to their Malnutrition Universal Screening Tool (MUST) score [2]. However, long-term use (≥ 6 months) of ONS has not been shown to be effective in improving nutritional status any further [7]. Although ONS are one of the main treatments for malnutrition amongst older adults, there is limited evidence for their efficacy amongst community dwelling older adults who may benefit from a "food first" approach, encouraging the intake of high calorie fortified foods [8].

This research tests hypotheses examining three interlinked phases of community prescribing support care. We hypothesised that dietitians working in the Southampton Community Prescribing Support Service would be 100% compliant with National Institute for Health and Clinical Excellence (NICE) Clinical Guideline (CG) 32 "Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition" with particular reference to two standards namely standard 1.3.1, which considers the provision of nutritional support in malnourished adults, and standard 1.5.6, which provides recommendations for follow up by an appropriate qualified health care professional. These standards were chosen as they identify entry and exit criteria and outcome measures for nutrition support within a prescribing support service. We also hypothesized that there will be a high

level of service satisfaction (90%) among community dwelling adults accessing the prescribing support service and that prescribing support service dietitians in the UK use weight gain >10% and BMI >18.5 kg/m^2 as outcome measures for exit criteria of nutritional intervention as identified by NICE CG32.

Therefore, the objectives of this study were to retrospectively audit patient records to assess compliance of accepting patients into the prescribing support service caseload against NICE guidelines 1.3.1 and 1.5.6, to assess patient satisfaction with the prescribing support service, and to characterise prescribing support dietitians compliance with NICE standards 1.3.1 and 1.5.6. This study advances human nutrition by exploring compliance with national clinical standards for the identification and management of malnutrition amongst community dwelling older adults and user satisfaction with a local prescribing support service.

2. Method and materials

2.1 Phase 1: An audit to assess compliance of Southampton Community Prescribing Support Service with NICE standards 1.3.1 and 1.5.6

A retrospective audit of dietetic records was completed for community dwelling adults referred to the Southampton Community Prescribing Support Service from January 2016 to December 2017. This time period was chosen to provide two complete years of patient records to examine. Inclusion criterion: patients reviewed by a prescribing support dietitian at least once between January 2016 and December 2017, with a nutrition care plan recorded. Exclusion criteria: absent nutrition care plan or patient demise before dietetic support was complete. Dietetic records were consecutively screened until the sample size was achieved. Data collection was completed by a single researcher (GA).

Clinical guideline standards chosen were as follows:

CG32 Standard 1.3.1: “Nutrition support should be considered in people who are malnourished, as defined by any of the following:

1. a BMI of less than 18.5 kg/m^2

2. unintentional weight loss greater than 10% within the last 3–6 months
3. a BMI of less than 20 kg/m^2 and unintentional weight loss greater than 5% within the last 3–6 months"

CG32 Standard 1.5.6: "People having oral nutrition support and/or enteral tube feeding in the community should be monitored by healthcare professionals with the relevant skills and training in nutritional monitoring. Individuals should be monitored every 3–6 months or more frequently if there is any change in their clinical condition. A limited number of observations and tests should be performed [1]."

- Audit standards for 1.3.1: All adults (100%) referred to the prescribing support service for nutrition support have been identified as malnourished using the entry cut-offs identified.
- Audit standard 1.5.6: All adults (100%) within the prescribing support service caseload have a dietetic review at least every 6 months.

Other clinical data collected as part of the audit included information on diagnosis, *a priori* medical conditions classified into three main groups: *general* e.g. chronic fatigue syndrome, hyperthyroidism, irritable bowel syndrome, ovarian cancer, prostate cancer, chronic kidney disease; *cognitive* e.g. dementia, Alzheimer's, Parkinson's, severe depression; *respiratory* e.g. chronic obstructive pulmonary disease, emphysema, bronchiectasis, heart failure. Data collection included source of referral, type of ONS prescribed on referral to and on discharge from the service, nutrition goals that were set, multivitamin requested, energy and protein requirements calculated, and side effects experiences as a result of taking ONS (Figure 1).

A power calculation was used to determine a suitable sample size for the audit. This was based on the current case load of 150 patients, with an expected standard compliance of 95% per standard using 90% confidence intervals with a margin of error of ± 5% of 50 patients per standard, it was estimated a total of 100 patient records would be required to test the hypothesis that prescribing support dietitians are compliant with the NICE standards relating to identifying and managing community dwelling adults with malnutrition.

2.2 Phase 2: Exploring patient satisfaction with the local dietitian prescribing support services

An anonymous questionnaire was developed by two of the authors (GA, LVM). It was distributed and tested during a routine home visit with five prescribing support patients with a view to obtaining feedback on the design and content of the questionnaire, after which iterative changes were made accordingly (Figure 1).

Using the current caseload (n=150), patient records were reviewed consecutively by a single researcher (GA), and those patients identified as having sufficient capacity to complete the questionnaire independently were sent the anonymous questionnaire to complete. The finalised anonymous questionnaire was distributed via the postal service to 52 patients along with a participant information sheet and a stamped addressed return envelope. An *a priori* standard of 90% patient satisfaction was set based on levels reported by other groups [9]. The questionnaire included 29 questions relating to the Southampton prescribing support service. Respondents were asked about the process of arranging a home visit, what was discussed during the home visit, contact with the dietitian outside of the arranged home visits, and experience of taking prescribed ONS. Participants also had the opportunity to give feedback using open-ended text boxes as well as providing multiple responses to the same question. No patient identifiable information was collected and the respondents remained anonymous.

2.3 Phase 3: Exploring compliance to national standards by dietitians in the UK

An anonymous online-survey was developed by two of the authors (GA, LVM) and sent to all members of the Older People's Group of the British Dietetic Association (n = 235). The survey was distributed via a proprietary online platform hosted by the University of Southampton (iSurvey: https://www.isurvey.soton.ac.uk/). Responses were downloaded in a CSV excel file (Figure 1). The survey consisted of 22 questions considering current practice within community prescribing support. Practice related questions included calculation of energy and protein requirements, nutrition assessment including criterion used for identifying malnutrition, nutrition support approaches including; food first and ONS, types of food related goals set, details of written information

provided, number of reviews completed per patient, ONS and factors that affect compliance. Participants were given the opportunity to provide additional comments using open-ended text boxes. Participants were able to give multiple responses to the same question.

The research was approved by the Cardiff Metropolitan University Ethics Committee. No ethical approval was required for the audit from University Hospital Southampton as it was a clinical audit (Number 5651).

2.4 Statistical analyses

The results of the audit were analysed using Graph-Pad Prism 7 (San Diego, CA). Descriptive statistics was generated for all reported measures. Survey data were summarised as counts (yes = 1) and percentages. Free text comments were analysed using an established content analysis approach [10]. Initial codes from the comments were created, followed by sub-categories and overarching themes/categories. For the audit, continuous variables were described using mean and standard deviation or median and inter-quartile range depending on data distribution. Parametric and non-parametric tests were used as appropriate. Statistical significance was established as p value <0.05.

3. Results

3.1 Southampton Prescribing Support compliance with NICE Standards 1.3.1 and 1.5.6

Of the 107 patient records consecutively screened, 100 met the inclusion criteria and 7 were excluded; 4 of these did not have a care plan in place and 3 patients died during the treatment period (figure 1). Included patients were aged 77.3 ± 14.5 years and were classified as having general (n=22), cognitive (n=46) or respiratory (n=32) conditions. Of these patients, only 19% of referrals had a MUST score completed, but 84% of patients referred by a General Practitioner (GP) had unintentional weight loss.

Nutrition support was provided in a variety of ways. ONS drinks were prescribed in addition to another intervention for 95% of patients (n=95). ONS drinks were prescribed for 53 patients; 34 were advised to have snacks throughout the day (18 of these in addition to ONS), 9 were advised to

have regular meals (4 of these in addition to ONS) and 37 were advised to have snacks and hot milky drinks (20 of these in addition to ONS).

Follow up to determine on-going requirement for ONS was left with the patient's GP. The GPs in the local area do not have an explicit exit criterion for stopping ONS prescriptions. Dietitian reported patient compliance with the prescribed ONS was approximately 70%; this was reported by the dietitian referencing good levels of compliance within their patient record following a diet history. Community dwelling adult patients within Southampton City had an average of 4 ± 2 reviews by a prescribing support dietitian, over a total period of 5.3 ± 4.5 months.

There was no statistically significant difference in weight or BMI change from referral (entry) to discharge (exit) following ONS or other nutrition support (Table 1).

Compliance with audit Standard 1.3.1: All adults referred to the prescribing support service for nutrition support should be identified as malnourished using the entry cut-offs identified. Eighty four percent of patients referred to the service had a reported unintentional weight loss, but it was not recorded whether this was >10% or in the last 3 – 6 months. The percentage of patients on the caseload that achieved the malnutrition cut offs according to CG standard 1.3.1 by prescribing support dietitians was 46%, of which 37% of patients had a BMI of ≤ 18.5 kg/m^2. Nine percent of patients had a BMI of <20 kg/m^2 and unintentional weight loss reported but it was not reported whether this weight loss was greater than 5%

Compliance with audit standard 1.5.6: All adults within the prescribing support service caseload have a dietetic review at least every 6 months. Only 82% of patients were provided with a follow up appointment.

Compliance with either standard was not achieved.

3.2 Patient satisfaction questionnaire

Fifty-two patient satisfaction surveys were distributed to patients with a response rate of 28% (n=15). Eighty six percent (n=13) of respondents felt satisfied with the dietetic support available to them and 73% (n=11) were aware of how to contact the dietitian for additional support. Sixty six

227 percent (n=9) reported that weight related goals were set during a home visit, but only 40% (n=6) felt
228 these goals would be easy to meet. Sixty six percent (n=9) reported that the written information given
229 to them was easy to understand. When dietary information given at home visits was examined, 46%
230 of patients (n=7) reported being advised about various food fortification techniques. Patients
231 consuming ONS reported feeling healthier (26%) and feeling energised (23%), with side effects
232 including constipation (15%), diarrhoea (8%), bloating (6%), nausea (6%) and feeling full (6%). Some
233 patients reported that they would have preferred a smaller volume drink (26%) and that a different
234 flavour may have improved compliance (20%). Free text comments from the survey were captured
235 from four sections including; overall comments about the service, ease of making an appointment,
236 meeting nutrition goals and areas for improvement (Table 2). From the patient survey the overall
237 satisfaction rate (86%) fell short of the standard set (90%).

238 ***3.3 Dietetic practice survey***

239 Out of the 235 dietitians within the British Dietetic Association group, 40% (n=93) opened the
240 survey and it was completed by 25% (n=58). Twenty nine percent of these (n=17) had <5 years'
241 experience and 47% (n=27) had >10 years' experience. Thirty one percent (n=18) were prescribing
242 support dietitians. The criteria used to monitor success of nutrition support by dietitians were weight
243 (96%; n=56) and BMI (94%; n=55) (Table 3). Entry criteria using anthropometry in standard 1.3.1 for
244 the commencement of nutrition support in individuals who are malnourished was not assessed,
245 however, 100% of the respondents provided nutrition support to patients at risk of malnutrition in
246 the form of food fortification advice, with hot milky drinks as the most common recommendation
247 (Table 4). If this did not result in weight gain, ONS was considered. Ninety four percent (n=55) of
248 respondents reported reviewing patients within 4 weeks to 6 months, therefore, not complying with
249 standard 1.5.6 (all patients should be reviewed by 6 months). Dietitians reportedly did not use >10%
250 weight gain and BMI > 18.5kg/m^2 as the exit criteria of nutritional intervention as identified by NICE
251 CG 32.

Data extraction for the qualitative comments in the dietitian survey regarding "exit criteria" for nutrition support was completed using an established thematic analysis approach. Initial codes were created and categorized into themes which were then reviewed [11] [12]. Once the codes and broader themes had been created, framework analysis was undertaken in order to identify over-arching themes relating to exit criteria for nutrition support of malnourished community dwelling adults. Four over-arching themes were identified including; i) nutrition supplements (ONS)/food; ii) variation in nutrition practice; iii) nutrition support of no benefit; iv) outcomes used for entry and exit criteria for nutrition support (Table 5a, 5b).

4. Discussion

Treating malnutrition in older adults may improve their health and quality of life and reduce healthcare costs [13, 14]. Within the UK, it is estimated that up to 14% of community dwelling older adults may be at risk of malnutrition [15]. Malnutrition is estimated to cost the NHS across the UK £30.7 billion per year [5]. ONS are often used to manage malnutrition and have been shown to improve weight gain in a care home setting [2]. The cost saving associated with using ONS within an acute hospital setting in the UK is approximately £746 per patient [7]. A 2015 report by the British Association for Enteral and Parenteral Nutrition (BAPEN) showed potential cost savings of £119,000-£432,000 per 100,000 people [14]. It is essential to ensure ONS is prescribed to those who will benefit most. In addition, it is important to ensure there are appropriately timed nutrition reviews by a qualified health care professional (e.g. a dietitian) to evaluate individual progress, as well as timely exit from nutrition support once nutrition goals have been achieved [1]. NICE guidance for the management of nutrition support for adults (oral nutrition support, enteral tube feeding and parenteral nutrition) provides standards for best practice with regards to the identification and management of adults with malnutrition. Four aspects of nutrition care are identified in NICE CG32: i) screening for risk of malnutrition, ii) treatment, iii) documentation of results and nutrition support goals, iv) self-management of artificial nutrition support including exit criteria of nutritional intervention [1.]. In this current study, we have examined aspects relating to NICE CG32, including

nutrition screening and compliance with exit criteria of nutritional intervention by a community prescribing support service. In addition, we have considered patient satisfaction with a local service and finally we have conducted a survey of national practice with the management of malnutrition by dietitians of community dwelling older adults.

In this study only 19% of patients referred to the Community Prescribing support service by a GP had a MUST score completed, similar to levels reported in a cross-sectional audit of GP Surgeries within the Wessex region of the UK [16]. As part of Regulation 14, the Care Quality Commission, UK states within their guidance that "Providers must include people's nutrition and hydration needs when they make an initial assessment of their care, treatment and support needs and in the ongoing review of these", and within our local Clinical Commissioning Groups all adults should be screened for nutrition risk on admission to hospital. However, in a community setting, adherence to this varies, and there is a paucity of evidence relating to the implementation of nutrition screening tools such as MUST within primary care settings [17]. Despite this, the use of simplified screening tools by GPs may help to identify patients at risk of malnutrition [18], ensuring timely nutrition support to prevent a further decline in nutritional status [19]. In order to address these issues, the Wessex Academic Health Science Network (WAHSN) have developed the Older People's Essential Nutrition (OPEN) toolkit, which aims to provide undernutrition awareness training [16], although further work is required to assess the specificity and sensitivity of tools within this population group [20].

Within our cohort, 84% of older community dwelling adults were referred by a GP for unintentional weight loss. Despite only 46% meeting the criteria for nutrition support as outlined in the NICE guidance, they were accepted onto the Community Prescribing Support caseload, underlying the difficulties in assessing who may benefit most from nutrition support based on the current criteria around weight loss and BMI. It has been reported that malnutrition in older people is often underdiagnosed and poorly recognised by health care professionals [21] [22]. In recognition of this problem, the Global Leadership Initiative on Malnutrition (GLIM) aims to standardise the clinical

304 practice of malnutrition diagnosis, recommending that in order to diagnose malnutrition at least one
305 phenotypic criterion is present e.g. weight loss, reduced BMI and reduced muscle mass, as well as
306 one aetiological criterion e.g. reduced food intake/assimilation and disease burden/inflammation
307 [23]. Although the majority of patients referred to the community support service had a
308 documented unintentional weight loss by a GP this was not quantified, suggesting poor
309 understanding of malnutrition and anthropometrical measures required (e.g. weight and height) to
310 be able to make a diagnosis [16]. Nutrition guidelines recommend that nutrition screening should be
311 completed by health care professionals who have undergone appropriate training [1], but do not
312 specify how, where or by whom this training will be provided. In order to improve nutrition
313 awareness and competence for completing nutrition screening, health care
314 organisations/professionals should consider the implementation of a quality assurance framework
315 to support the use of anthropometry in all clinical care settings, including the adoption of
316 standardised operating procedures, competence training and cut-offs to be used to identify those
317 adults at risk of malnutrition, as part of the routine screening process [24] [25].
318 Within the current referral process to the community prescribing service, weight,
319 percentage weight loss in the last 3-6 months and BMI are not included. A quality improvement
320 arising from this study will be to ensure anthropometry is recorded as part of the referral to allow
321 community prescribing support dietitians to accurately identify those patients with malnutrition or
322 nutrition risk. For those patients not meeting the criteria for nutrition support it would allow the
323 signposting to information with regards to food fortification or other services, ensuring health care
324 resources are more appropriately utilised. An important barrier to screening for nutrition risk by
325 health care professionals is the time taken to use screening tools, including the measurement of
326 weight and height to calculate BMI. Some of this burden could be overcome by providing patients
327 with the opportunity to complete parts of the screening tool independently, although some patients
328 may be reluctant to disclose poor dietary habits or recent weight loss [26]. In the future, studies

329 which are adequately powered and address issues relating to barriers and facilitators to nutrition
330 screening are required [25, 27].

331 The second guideline (1.5.6) used as the benchmark of dietetic input in this work considered
332 monitoring frequency of community patients; this guideline states that stable patients should be
333 monitored every 3-6 months. Eighty two percent of patients were provided with a follow up
334 appointment. Nutritional intervention should be monitored on a regular basis [28]. Despite the
335 ubiquitous use of ONS amongst community dwelling adults, there is a paucity of data with regards to
336 optimal dosing, duration and impact on usual dietary intake. A study considering ONS
337 supplementation (2 x 235 ml drinks per day) for a duration of 16 weeks amongst elderly adults did not
338 show improved weight gain or muscle indexes but did show significantly improved cognitive function
339 and fewer days in bed [29]. However, evidence for the efficacy of ONS as the most effective means of
340 managing malnutrition in community dwelling adults remains inconsistent, and optimal duration of
341 treatment requires further investigation [27, 30].

342 In this cohort of malnourished community dwelling older adults, the use of ONS did not
343 improve weight gain or BMI during the audit period suggesting either poor compliance with
344 consuming the ONS or an unintended impact of the ONS leading to food displacement e.g. reduced
345 dietary intake from food., In this study, ONS and food fortification advice were recommended
346 together, and it may be that ONS resulted in food displacement as dietitians reported a good
347 compliance with ONS consumption (70%). However, it could also be there is a mismatch between
348 dietetic perception of compliance and actual compliance. A study carried out by Lad *et al.* [31]
349 examining patient compliance of consuming ONS in a hospital setting and in the community found
350 that only 43% of the patients consumed over 80% of the prescribed ONS in the community, supporting
351 the theory of a mismatch of dietetic perception and actual compliance, which has been demonstrated
352 in other patient cohorts [32]. If compliance could be identified more accurately, appropriate
353 prescriptions could be provided, thus reducing wastage. In contrast, a systematic review carried out
354 by Hubbard *et al.* [31] showed compliance levels with ONS were 81% in the community, a finding

355 further supported by Liljberg *et al.* who reported 93% compliance with ONS prescribed [33], consistent
356 with the high level of perceived compliance reported in the current research.
357 One unexpected finding around compliance was patients reporting feeling full; thus they will
358 likely reduce the intake of usual foods [34, 35], which may explain why the use of ONS did not result
359 in improved weight gain or BMI. Patient feedback from the satisfaction survey revealed a number of
360 positive aspects of ONS such as making respondents feel healthier and energised, but the negative
361 effects included feeling full, constipation, diarrhoea, bloating and nausea. Some patients reported that
362 they would have preferred a smaller volume drink and that a different flavour may have improved
363 compliance. The findings of the current study contrast with research showing that use of ONS for 12
364 weeks amongst older people living in a nursing home resulted in significant improvements in weight
365 gain [2]. Gibbs *et al.* [16] examined dietetic practice across the UK in terms of chosen intervention,
366 reporting that dietitians typically use a food first approach for care planning in the community,
367 followed by the use of ONS if this approach does not result in weight gain, which was confirmed in the
368 results from our national survey where 100% of respondents used a food first approach before trying
369 ONS. This type of approach based around nutritional behaviour management has been shown to have
370 a positive impact on the nutritional status of patients at high risk of malnutrition as a result of upper
371 gastrointestinal cancer [17]. Dietary counselling using a food first approach has been shown to be an
372 effective way of improving dietary adequacy and promoting weight gain in community dwelling elderly
373 adults and is the current focus of a BAPEN campaign. Food displacement should be recognised as an
374 unintended consequence of use of ONS and as dietary counselling has been shown to be as effective
375 in the management of malnourished patients, it should be considered as first line.
376 Sixty percent of patients who took part in the patient satisfaction questionnaire reported
377 weight related goals being discussed during home visits; research has shown that if goals are
378 updated regularly (e.g. every visit) behaviour change is more likely to occur [6]. It is possible that the
379 patients who did not report receiving these goals had simply forgotten about them. Of those
380 patients who reported discussing weight related goals, 20% reported feeling that the goals were not

achievable. Satisfaction with a service needs to be investigated further considering culture, behaviour, and socio-demographics [1839], along with patients' health related quality of life. However, the reported patient satisfaction with the community prescribing service of 86% is in line with that reported elsewhere [9].

The response rate of the dietitian survey was comparable to other studies also examining dietetic practice across the UK [40]. Results of the dietitian survey indicated that, although weight gain and BMI are the primary outcome measures used by dietitians across the UK to monitor success of dietetic interventions, there were a number of dietitians relying on other measures of anthropometry to identify patients with malnutrition. The use of weight and BMI is recommended as a criterion for diagnosing malnutrition [23]. Although, compliance with measuring weight and height is often poor in a hospital setting with less than 50% of adults measured on admission [41], there is a paucity of information relating to these measures being completed in a GP setting [16]. In the national survey, 38% of dietitians used handgrip strength as an alternative outcome measure. Low handgrip strength has been shown to be associated with malnutrition [1542]. Handgrip strength has been used as a proxy measure for loss of muscle mass in elderly patients and low handgrip strength is associated with sarcopenia in this age group [43, 44]. Although it is an attractive alternative to using weight or BMI, specific standard operating procedures need to developed including the model of dynamometer to be used and which age and gender related reference cut-offs should be used to diagnose malnutrition [44].

Using a thematic analysis on the free text responses in the national survey, four over-arching themes were identified including; i) nutrition supplements (ONS)/food; ii) variation in nutrition practice; iii) nutrition support of no benefit; iv) outcomes used for entry and exit criteria for nutrition support. From our own local audit and that arising from the national survey, it was clear there were considerable differences with regards to; i) nutrition support for malnutrition, with a food first approach employed by dietitians working nationally, but a combined food first/ ONS approach used locally, ii) variation inentry criteria to community prescribing support services and iii) exit criteria once

nutrition goals have been achieved. Variation in dietetic practice is reported to occur in other spheres of nutrition support including intestinal failure [45], diabetes mellitus type 2 [46] and head and neck cancer [47]. To our knowledge there are no studies considering the impact of variation in nutritional practice and outcomes related to the management of malnutrition in community dwelling adults. Further work is required to better understand the impact in terms of nutritional/clinical outcomes, as well as those relating to patient's health-related quality of life and health economic outcomes, particularly as malnutrition as well as the use of ONS represent a significant cost burden to the NHS [19].

There are a number of limitations to this study. Firstly, a large number of dietitians viewed but chose not to complete the survey. This may be explained by the survey dissemination method, whereby the survey link may have been shared with professionals who were not directly involved in the care of this patient group e.g. hospital based dietitians and not those working in the community. As such, the views and reported dietary management of adults with malnutrition may not be wholly representative. Given the low response rate to the patient satisfaction survey, the distribution method may not have been ideal (e.g. self-addressed stamped return envelope) as patients may not have been able to post the completed questionnaire. There are a number of factors which could be included in future surveys to improve response rates including shorter questions, personally addressed letters and providing a second copy of the survey [48, 49]. The small sample size of returned patient satisfaction questionnaires is likely to have impacted on the reliability of the obtained results, as the answers may not be representative of the opinions of the wider service population. More work is required locally to understand whether a quality improvement project considering the implementation of a nutrition pathway, such as the OPEN toolkit developed by WASHN, using a food first approach would improve nutritional and clinical outcomes. Further work is required both locally and nationally as to how nutrition risk and assessment tools should be used including the development of standard operating procedures regarding anthropometric measurement and cut-off values to be used including those relating to handgrip strength. The

433 impact of this work on patients is that it shows the mismatch between perceived compliance and
434 actual compliance; therefore, dietitians may be less likely to prescribe ONS if they feel it is not going
435 to be taken as prescribed. The impact of ONS on food displacement was not assessed in this study
436 and further work is required within our local cohort to determine the impact of this on dietary
437 adequacy, as a food first approach and dietary counselling may be as effective as using ONS (16). The
438 dietitian survey has also shown that dietitians across the UK tend to follow similar practices with
439 regards to ONS use, although there is considerable variation in exit criteria with regards to nutrition
440 support.

441 Further research is required across the world to examine whether a food first approach and
442 dietary counselling would be more effective at managing malnutrition, particularly as ONS is
443 expensive. Future work should consider aspects relating to compliance with nutrition risk screening
444 and assessment, as well as the development of exit criteria signalling the end of nutrition support
445 within a nutrition pathway [35].

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Competing interests:

None of the authors has any conflict of interest to declare in relation to this quality improvement project.

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Table 1: Weight and BMI (mean ± SD) for patients with general, neurological or respiratory conditions on referral to the prescribing support service and at the end of treatment

	Referral weight (kg)	Discharge weight (kg)	P value	Referral BMI (kg/m^2)	Discharge BMI (kg/m^2)	P value
General (n=22)	50.1 ± 15.9	51.0 ± 15.4	0.4	19.3 ± 4.4	20.1 ± 3.9	0.3
Neurological (n=46)	50.67 ± 14.7	50.9 ± 13.3	0.6	18.9 ± 3.8	19.6 ± 3.8	0.3
Respiratory (n=32)	48.2 ± 10.6	50.3 ± 12.1	0.3	18.2 ± 2.7	19.0 ± 3.2	0.4
All conditions grouped (n=100)	49.6 ± 13.5	50.9 ± 13.0	0.6	18.6 ± 3.5	19.4 ± 3.5	0.1

Table 2: Free text comments from the patient satisfaction survey (n=15)

Comments about overall service
• Appetite still low • I think patients with dementia need more help with practical advice and help from a carer • The dietitian who came out to visit was very helpful and professional, her advice to me was brilliant and the advice on what food will help me. • Carers did this as patient's dementia would not comprehend what to do. • I have seen a lot of nutritionists at appointments and in hospital, for nearly a month, then again at home; they have all been very helpful and I am now 7 stone from 6 stone. • I am pleased to write that I'm much better now and have regained the weight loss. Thank you.
Was it easy to arrange a home visit from the prescribing support dietitians?
• Hard to get hold of
Was it easy to meet the nutrition goals set by the prescribing support dietitian?
• Did not put weight on • Just cannot gain weight • Do not eat much
Any there are service improvements that could be suggested?
• Mum is no longer capable of feeding herself. The dietitian really doesn't understand mum's needs or illness. • My dietitian is excellent • I will start taking vitamin D tablets on advice from the dietitian on her last visit. • Very grateful for the dietitian to come and visit me at my home and extremely pleased that I am feeling so much better.

Table 3: Methods used to monitor success of dietetic intervention by community dietitians across the UK (n=52)

Method used	Percentage reported to use the method (%)
Weight	96.2
BMI	94.3
MUST score	83.0
Mid Upper Arm Circumference	69.8
Handgrip strength	37.7
Multiple response answers	87.9

Table 4: Comments from the survey of national dietetic practice across the UK

Questions	Free text comments
Do you initially try a food first approach? If no, why?	• This is not relevant too my post. My role is to support GP's and pharmacists with their prescribing of food stuff. I do not advise patients. • It depends on the patients' nutritional problems and the support they have at home and whether supplements have already been started. Food first is always part of the treatment plan though • I don't do home visits and our community team only do home visits for patients on enteral nutrition • Depends on my assessment. I only accept referrals for patients with MUST score 2 or more, so they are immediately eligible for ONS. If I feel there is an opportunity to start with food first and assess progress before ONS, I will do so but clinical indications may mean I start on ONS immediately
What type of information do you provide? If you don't provide any, why not?	• Hoping to get online info for the future too • I educate other health professionals to advise. I advise other healthcare professionals to provide food first and I have developed food first leaflet or use the one from the malnutrition pathway website.

672 **Table 4a: Dietitian – free text comments regarding exit/ discharge criteria (n=52)**

Free text comments relating to "Exit criteria for community prescribing support"
Stable weight, improved nutritional intake
Competed 3 consultations, this is explained at the beginning that they will be given 1 assessment and 2. Follow ups over an 8 week period. This can be extended if feel that further input is needed but eliminates long term monitoring because of dietitians struggling to discharge and identify when dietetic intervention stopped.
Stable weight and no ONS
Patients are never discharged if they are on a nutritional supplement for others when the best outcome has been achieved e.g. wt gain/wt stable/maximized intake.
Not really. I don't really have a caseload and so typically would only see someone once, however if I have made any changes to their care such as stopping / starting supplements then I would likely see them again but I don't have rules by which I discharge people by.
Achievement of goal or stable or managing own care
If non-compliant, input limited - discharge. If maintaining weight at realistic or healthy BMI. If requests discharge or does not opt into service initially. If Do Not Attend appointments x 2
Patients are at the desired weight/identified outcome OR patients only require food fortification advice and don't need a review OR patients will require supplements for a chronic condition e.g. COPD and further input from the dietitian is unlikely to be of benefit; if the situation changes then patients should be re-referred. Also patients who DNA or routinely cancel are considered for discharge.
Stable off ONS
Target achieved - this may be wt/BMI or other goal e.g. wound healing, quality of life OR patient stable and monitoring handed over to primary care staff or care home
We set clear SMART goals that are individual to the patient and review these. Once goals achieved/there is a plan in place to work towards these discharge is planned
1. Once patient has stopped ONS. 2. Or once patient has been referred to another Dietitian who will monitor their ONS.
My team predominately works in care homes, we complete a 6 month outcome and if the nutritional aim is met we discharge. If not we will seek to reflect on the reasons why as a team. In terms of compliance with consumption of ONS- if advised by my team this is high as a holistic and realistic plan is made. For MDT colleagues such as GPs, nurses or acute dietetic colleagues compliance reduces to 20% in my experience
Goals achieved or further input not indicated
Contact details provided for concerns
1) Treatment complete 2) Likely to need ONS long term so can be referred back to GP with clear review criteria.
Dietetic goal met; Patient RIP; Patient unable to implement recommendations/Transfer of care
Achievement of a healthy BMI, and weight maintained for 1-3 months
Meet targets, or no benefit from further input
Stable on long term food first or ONS, may have target weight.
To prevent weight loss/ and promote weight gain
Weight gain achieved or All dietetic advice provided and no more can be offered or Patient/career doesn't wish further advice
Nutritional goals
Achievement of goals

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Table 4b: Development of codes, sub-categories and overarching themes

Initial coding (n=21)	Sub-categories (n= 12)	Overarching themes (n=4)
Fixed number of consultations	Set number of consultations	Variation in nutrition practice
Referred back to GP	No end to treatment	
Treatment period complete		
Indefinite time period	Referral back to GP	
Long term ONS	Maximised intake	Nutrition supplements/food
Monitoring ONS		
Dietary adequacy	Nutrition support: ONS/food	
Food first		
Maximised intake	Dietary adequacy	
No benefit from further input	Poor compliance	Nutrition support of no benefit
Weight loss		
Death	Deteriorating health	
Transfer of care		
Non-compliance	Care transferred	
No exit criteria		
SMART Goals	Weight gain/ BMI	Outcomes used for entry and exit criteria for nutrition support
Weight gain		
Body mass index (BMI)	Nutrition goals achieved	
Nutrition goals		
Outcome goal achieved	Nutrition outcome	
Symptom resolution		
Stable weight		
Best outcome achieved		

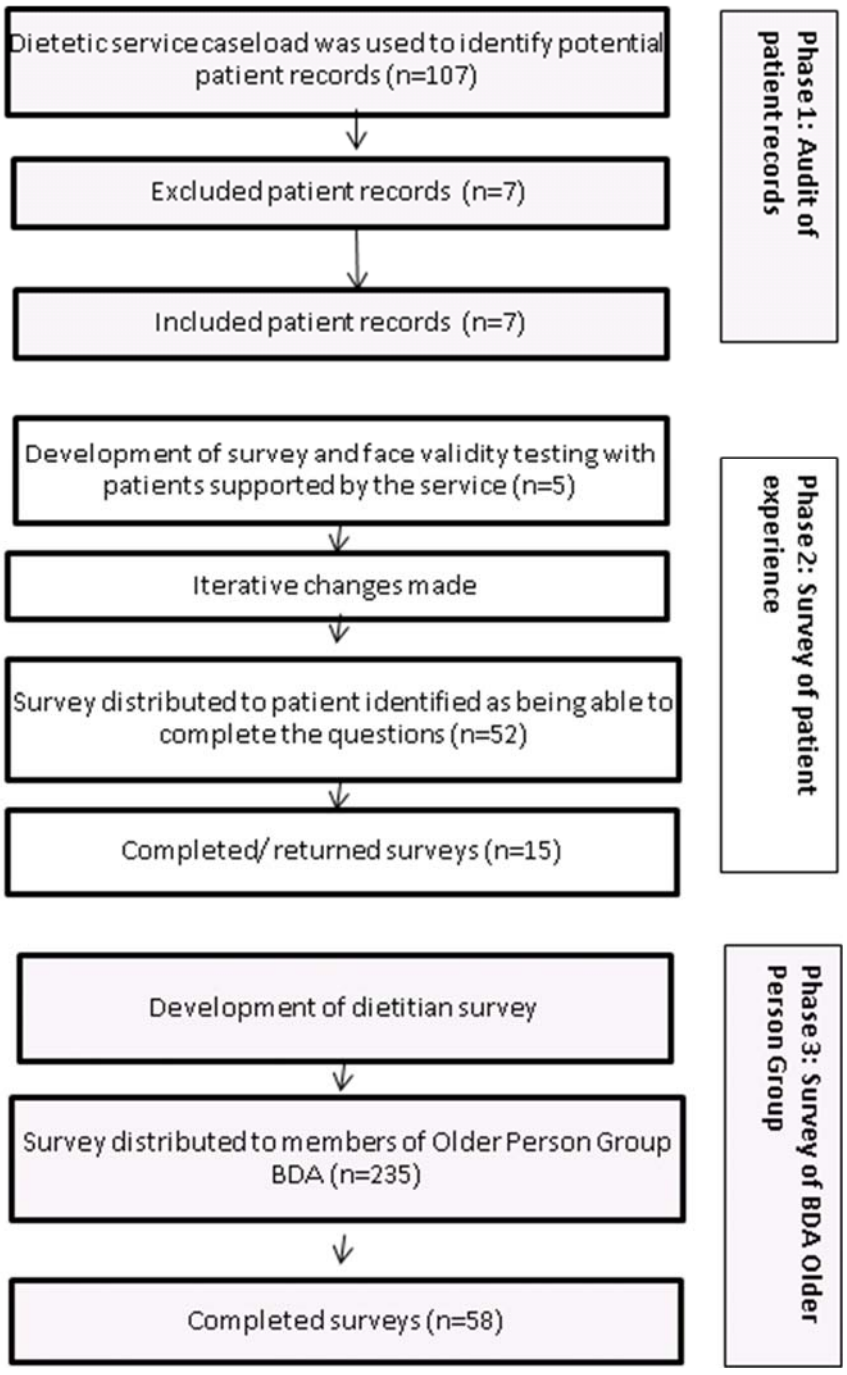

Figure 1: Study schematic for phase 1 – audit of patient records; phase 2 – survey of patient experience and phase 3 – survey of dietitians