An evaluation of the feasibility and validity of a patient-administered Malnutrition Universal Screening Tool ('MUST') compared to Health Care Professional screening in an Inflammatory Bowel Disease (IBD) outpatient clinic

Keywords
Malnutrition Universal Screening Tool, nutritional screening,
Inflammatory bowel disease, outpatients

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Abstract

Background: Malnutrition is common in Inflammatory Bowel Disease (IBD) and is associated with poor health outcomes. Despite this, screening for malnutrition in the outpatient-setting is not routine and research in the area is limited. This study aimed to evaluate whether agreement between malnutrition screening completed by patients and Healthcare Professionals (HCP's) could be achieved by comparing patient self-administered 'MUST' ('MUST'-P) to HCP administered 'MUST' ('MUST'-HCP) in a single tertiary IBD outpatient clinic.

Methods: We conducted a feasibility and validity study on adult outpatients with IBD. We collected anthropometric, nutritional and clinical data from patients. All patients completed 'MUST'-P using a self-administered questionnaire, followed by 'MUST'-HCP. 'MUST'-P was timed and feedback on ease-of-use was obtained. Malnutrition risk was classified as low (score=0), medium (score=1), and high (score≥2) and agreement tested using kappa statistics (κ).

Results: Eighty patients were recruited (Crohn's Disease:n=49, Ulcerative Colitis:n=29, Unclassified:n=2), with mean age 39.9±SD:15.1yrs, 51.2% were males. Seventy one (92%) of patients found 'MUST'-P either easy or very easy. The mean time to complete 'MUST'-P was 3.1±1.8min (range 1-10min). Sixty-eight (85%) of patients were at low risk of malnutrition when screened by the HCP. There was moderate agreement (κ=0.486, p<0.001) between 'MUST'-P and 'MUST'-HCP with 100% agreement in scoring for medium- and high-risk categories.

Conclusions: Our study suggests that self-screening using 'MUST' could be effectively used in an IBD outpatient clinic to identify those at medium and high risk of malnutrition. The patient friendly version of 'MUST';'MUST'-P was considered quick and easy to use by patients**.** Implementation of self-screening with 'MUST' could improve the nutritional management of IBD patients.

Introduction (maximum 2 pages)

Malnutrition can be defined as "a state of nutrition in which deficiency, excess or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue and body form (body shape, size, composition), function and clinical outcome" ([1,2]). It is a serious and common condition associated with significant morbidity and mortality, affecting adults and children with all types of diseases in all health care settings. Prevention, identification and treatment of malnutrition at an early stage could reduce potential health risks, dependency on others, hospital admissions and costs [(3,4)]. The economic impact of malnutrition risk due to increased use of health and social care resources, hospitalisation and length of hospital stay as identified using tools including 'MUST' is well documented ([5-6]). A study conducted in Portugal on 637 inpatients found that high risk of malnutrition in 21-29% patients, identified using malnutrition screening tools, was an independent predictor of increased hospitalisation costs ([7]). NICE recommend that all outpatients should be screened for malnutrition at their first appointment and screening should be repeated when there is clinical concern [(8)].

Crohn's disease (CD) and Ulcerative Colitis (UC) are the main types of Inflammatory Bowel Diseases (IBD), with a rarer type (Unclassified IBD-U) accounting for approximately 10% of all cases ([9]). In a northern English population the prevalence of IBD has been estimated at approximately 387 per 100, 000 population (243 per 100,000 with UC and 144 per 100,000 with CD) in 1995, with the prevalence of CD increasing faster than UC ([10]). IBD is associated with substantial morbidity, one aspect includes nutritional status where malnutrition and weight loss are common ([11-12]). Up to 75% of adults with active IBD are malnourished ([13-15]) and up to 33% of adults in remission have been found to be malnourished ([16]). IBD patients often alter their eating habits to alleviate their symptoms, potentially leading to malnutrition and weight loss ([17]). In addition to protein-energy malnutrition, deficiencies in trace elements and vitamins such as magnesium, iron and vitamin B12 are common ([18-19]). Prolonged symptoms as well as the disease management either by drug treatment or surgery may further impact on the nutritional status of patients.

Food and nutrition is viewed as a high priority for IBD patients ([20]) yet dietetic service provision remains poor with approximately 60% of inpatients receiving no dietetic contact ([21]). Malnutrition can be under-recognised in IBD patients as routine screening is not common practice, resulting in under-detection and thus under-treatment of malnutrition ([22,23]). Factors contributing to this include: lack of recognition of the detrimental effects of malnutrition in IBD, difficulties implementing nutritional plans, lack of staffing in busy outpatient clinics and lack of guidance on the management of those identified at risk of malnutrition ([21]). A systematic review looking at barriers and facilitators of adoption of nutritional screening by nurses concluded that it was unlikely, unless it was considered an integral part of the nursing assessment and was appropriate resourced ([24]). The use of patient self-administered malnutrition screening tools has been shown to be beneficial in the hospital outpatient setting ([25]).

The UK IBD Audit ([21]) advises that all IBD inpatients are screened for malnutrition and recommend 'MUST' as an appropriate tool. In addition, while nutritional screening guidelines exist for a variety of health care settings ([26]) no specific screening tool has been developed for IBD outpatients. Patient administered self-screening has recently been investigated in different studies and has demonstrated benefits in various disease states ([1,22,25,27]).

The 'MUST' tool is considered an appropriate malnutrition screening tool as it has face-, content-, concurrent- and predictive- validity with a range of other screening tools. It is also internally consistent and reliable and has very good to excellent reproducibility when used with different assessors in a variety of settings. Guerra et al ([7]) found agreement between 'MUST' and the ESPEN (European Society of Parenteral and Enteral Nutrition) recommended Nutrition Risk Screening tool ([26]) as a predictor for increased hospitalisation costs. The 'MUST' tool has been found to be easy, quick to use and acceptable to patients, research-participants and healthcare workers ([28-29]). Previous research examining self-screening in outpatients is either not IBD specific ([1, 27, 28]) or has not been conducted in the UK population ([22]).

This study aims to assess feasibility (completion time and ease of use) and validity of 'MUST'-P compared to risk classification obtained by 'MUST'-HCP in IBD outpatients. This research has the potential to improve patient care by contributing to the malnutrition risk identification, which impacts not only on the disease related complications but also on healthcare costs ([30]). Nutritional support to treat malnutrition may improve symptoms and allow deficiencies in calories as well as macro and micro-nutrients to be rectified ([18]).

Materials and Methods

Study design and population

This is a feasibility and validity study ([31]). Eighty three patients in the adult IBD outpatient clinic at UCLH were approached from the waiting area using convenience sampling over an 8-week period between May 2015 and July 2015. The inclusion criteria were patients with a confirmed IBD diagnosis and ≥ 18 years of age. Exclusion criteria were unwillingness or inability to provide informed consent and inability to communicate in the English language. Patients accompanied by a relative able to translate or act as an interpreter were recruited. Every effort was made to recruit all eligible patients to minimise selection bias. However three patients declined the invitation to participate, making the sample size eighty patients.

Ethical approval was sought from London Metropolitan University Ethics Committee and by the University College London Hospital research and development committee. Full ethical approval was not required as the study was deemed part of service evaluation. Written informed consent was obtained from all study participants and patients were assured of confidentiality and anonymity.

Data Collection

The tools utilised for the data collection were the patient administered screening tool ('MUST'-P) followed by the 'MUST' tool completed by the researcher ('MUST'-HCP) to screen the participants for malnutrition. Using routinely collected data from electronic databases and paper medical records information was collected on the characteristics of the patient group, including: demographics (date of birth, gender); anthropometry (height, weight and weight changes) and IBD type and date of diagnosis obtained from medical records. Well-being was taken from validated tools to measure disease activity in IBD: the Harvey Bradshaw Index ([32]) for CD and the Simple Clinical Colitis Activity Index ([33]) for UC which measures wellbeing on a 5-point likert scale from "very well" (0) to "terrible" (4). Referral to a Dietitian since diagnosis was also obtained. Area deprivation was based on national specific data of multiple deprivation rank from 2015, a composite score including income; employment; education, training and skills; health deprivation and disability; crime, barriers to housing and services; and living environment deprivation, with 1 missing value as one patient's postcode could not be assigned a deprivation score ([34]). The research team consisted of two qualified dietitians.

Malnutrition Tools

'MUST'-P

Patients were provided with a simple instruction sheet, BMI chart and weight loss tables. The HCP recorded the length of time the patient took to complete the tool. The patients were asked initially to complete the 'MUST'-P independently. The 'MUST'-P was the 'MUST' tool developed by Cawood et al ([27]) who adapted 'MUST' for patient use in a hospital outpatient setting. The BMI and weight loss charts were used from the British Association for Parenteral and Enteral Nutrition (BAPEN) tool kit ([35]). Following completion of the 'MUST'-P the patient was asked to rate the ease-of-use of the 'MUST'-P tool on a Likert scale (very difficult to very easy) and time for completion in minutes was estimated by the patient.

Health care professional 'MUST' ('MUST'-HCP)

The screening was completed by a trained HCP researcher using the BAPEN resources ([35]). Weighing scales and a stadiometer were both available in the clinic. Patients' height and weight was measured by a trained HCP and documented in the medical notes. The patients were informed of their weight and height.

Statistical analysis

Frequencies and percentages (%) were used to describe categorical variables. Mean, standard deviation (SD) and range (minimum and maximum) were used to describe continuous variables. Area deprivation was categorised as 'least' and 'most' by using the median of the national index of multiple deprivation rank. Risk scores from both administrations of 'MUST' were classified as low (score=0), medium (score=1), and high (score$\geq$2) risk, from which sensitivity and specificity was calculated. Agreement between the two tools was assessed using kappa statistics. The kappa coefficient (κ) was interpreted using the grading system of Landis and Koch (<0=no agreement; 0-0.20=slight; 0.21-0.40=fair; 0.41-0.60=moderate; 0.61-0.80=substantial; 0.81-1=almost perfect agreement) ([36]). In sensitivity analyses, we examined whether patient characteristics; age (young vs. old); gender (men vs. women); and IBD duration (short vs. long) would influence agreement between 'MUST'-P and 'MUST'-HCP.

Differences in demographic variables by IBD status (CD vs. UC) were presented by mean (SD) for normal continuous data and n (%) for categorical data, and tested using T-test and Chi-squared tests, respectively. P-values were two-tailed and set at a significance level of 0.05. Statistical Analysis was conducted using STATA version 14 [StataCorp, College Station, TX].

Results

Study population

Table 1 shows the demographic and clinical characteristics of the 80 IBD patients who participated in the study. Overall, the study sample consisted of 51.2% males and the mean age of participants was 39.9 ± 15.1 years old (range 19-84). The majority of the participants n=49 (61.3%) had CD. No demographic or clinical characteristics were significantly different by IBD status except area deprivation where those with CD were least likely to live in a deprived area compared to UC patients (p=0.01). However, there was a non-significant trend towards a lower BMI in the CD versus UC group. In total one UC patient had active disease and 3 CD patients had active disease (2 mild and 1 moderate).

Agreement between 'MUST'-P and 'MUST'-HCP screening

Of the eighty IBD patients included in the study, three patients (3.8%) refused to complete the 'MUST'-P for the following reasons; one due to eye sight difficulties, one considered that it should be done by a HCP, and one did not state a reason. Thus, the total sample size included for agreement analysis of 'MUST'-P and 'MUST'-HCP is n=77.

There was 100% sensitivity for patients who were at medium or high risk using the 'MUST'-P tool compared to the 'MUST'-HCP tool. However, specificity was somewhat lower in that 2 were scored as medium risk and 15 patients scored as high risk using 'MUST-P', whereas they were scored as low risk using 'MUST'-HCP. Overall, this meant that there was moderate agreement between the 'MUST'-P and 'MUST'-HCP scores as determined by the kappa statistic ($\kappa = 0.486$, $p<0.001$). We found no evidence that agreement between 'MUST'-P and 'MUST'-HCP was affected by stratification by age, gender, or IBD duration.

Ease of use and time to complete 'MUST'-P

Overall, 51.9% (n=40) of patients' reported the completion of 'MUST'-P as easy; 40.2% (n=31) rating it as very easy; 6.5% (n=5) as difficult and 1.3% (n=1) as very difficult. The average time for the completion of the questionnaire was 3.1 ± 1.8 min (range 1-10 min).

Prevalence of malnutrition assessed by 'MUST'-P

A comparison of the malnutrition risks as identified by the patients themselves and the researcher is shown in Table 2. There was 100% agreement between 'MUST-P and 'MUST'-HCP for all patients with medium and high malnutrition risk. However, this reduced to 74.3%

agreement with the 'MUST'-HCP score in the low risk category. This was due to 17 discrepancies with low risk categories, mostly associated with difficulty reading the BMI chart 22.7% (n=15) and 3% (n=2) were related to the weight loss score.

The proportion of participants with medium and high risk scores of malnutrition was explored using the 'MUST'-HCP. The results show similar proportions of the sample in the medium and high risk malnutrition categories: 8.8% (n= 7 patients) at medium risk- and 6.3% (n= 5 patients) at high risk- of malnutrition when screened by the researcher. Of the patients in the study at high risk of malnutrition 2 out of 5 had not been referred to a dietitian since diagnosis and 1 out of 5 had seen a dietitian but did not arrange a follow-up. In total 50 patients (62.5%) had seen a Dietitian since diagnosis. The majority of patients (91.3%) had a BMI score 0 in the initial part of the 'MUST'. 71 patients (88.8%) had minimal weight loss (≤5%) in the past 6 months and all the patients (100%) were not acutely ill while completing the study.

Outcomes of the three steps of 'MUST' used by the researcher to identify malnutrition

The 'MUST'-HCP identified that of 80 patients screened, 85% (n=68) 8.8% (n=7) and 6.3% (n=5) were at low risk, medium risk, and high risk of malnutrition, respectively. 91.3% (n=73) of patients had a low risk BMI, 3.8% (n=3) medium risk and 5% (n=4) high risk. 85% (n=68) of patients had no weight loss. Of the 15% with weight loss, 88.8% (n=71) had <5%, 8.8% (n=7) 5-10% and 2.5% (n=2) >10% weight loss. None of the patients were deemed acutely unwell. One patient at medium risk and one patient at high risk using 'MUST'-HCP had moderately active disease.

Discussion

Overall, the results showed that 'MUST'-P can be used to capture medium and high malnutrition risk in the IBD outpatient setting. If accurately implemented this could be included in patients' nutritional assessments. This bridges a gap in knowledge, as there is limited research to date exploring use of self-screening in IBD outpatients, particularly from UK based studies.

Accuracy of tool and ease of use of 'MUST'-P

Patient self-screening has been found to be an easy and well accepted tool, generating precise measurements compared with those made by a HCP ([25]). Our study found a moderate agreement between 'MUST'-P and 'MUST'-HCP (κ coefficient= 0.486, $p< 0.001$), such that

100% of IBD patients with medium and high risk of malnutrition were identified by the patient and the HCP; providing confidence in using a patient administered tool.

However, 17 'MUST'-P related discrepancies were identified, mainly relating to difficulty reading the BMI chart. In addition, there was no influence of age, gender and IBD duration on agreement between 'MUST'-P and 'MUST'-HCP. Other studies have found the discrepancies between HCP and patient self-screening were mostly associated with the weight loss and BMI score ([22,27]). The use of mobile technology for calculating 'MUST' scores could help facilitate the implementation of 'MUST'-P by improving its accuracy and ease of use for patients, thus improving compliance. McGurk et al ([25]) investigated 'MUST' self-screening using digital technology to calculate BMI in a gastroenterology outpatient clinic. All patients were able to self-screen and there was perfect agreement in test-retest reliability between the patient and dietitian suggesting that use of digital screening may produce more accurate results.

Based on previous published studies, with the exception of reports from McCurk et al ([25]), the majority of IBD patients reported the completion of 'MUST'-P as either easy or very easy. This study is consistent with previous findings by Sandhu et al ([22]) where 96% of IBD patients rated self 'MUST' screening as either easy or very easy to understand and complete.

This study used a patient friendly version of 'MUST' adapted from Cawood et al ([27]). In our study the average time for completion was 3.1 ± 1.8 min (range 1-10 min) and 100% completed the tool in 5 minutes or less. Cawood et al ([27]) found 75% of 205 outpatients were able to screen themselves in less than 5 minutes and rated the self-screening as easy or very easy. In a Canadian study ([22]) of 154 IBD adult outpatients, all patients were able to self-screen and 96% reported the tool as either easy or very easy to use. Cawood et al ([27]) observed that the overall prevalence of malnutrition (medium and high risk) was similar between self-screening (19.6%) and HCP screening (18.6%) which correlated well with our study findings.

Prevalence of Malnutrition

Our study suggests that the prevalence of malnutrition in the IBD outpatient-setting at UCLH is low compared to other published studies ([13-16]). This is possibly enhanced by close monitoring by an IBD multidisciplinary team. However, due to the small size in our study these results should be viewed with caution. When screened by the HCP the majority of patients (85%) were at low risk of malnutrition, with 8.8% and 6.3% of the sample at medium and high risk, respectively. Seventy one patients reported less than 5% of weight loss in the last 6 months and had a low-risk BMI.

Few studies to date have specifically looked at prevalence of malnutrition in IBD outpatients. Vadan et al., ([15]) found that 59.3% of 30 patients attending a Gastroenterology Clinic in Bucharest were malnourished, whereas, in a UK based study ([29]) there was a high prevalence of malnutrition identified in general gastroenterology outpatients using different tools including 'MUST'. Interestingly, in this study the mean BMI score indicated the UC patients were overweight (mean BMI: 27.6kg/m^2) and CD patients were at the upper end of the healthy weight range (mean BMI: 25.3kg/m^2). Obesity as well as increased fat mass has been associated with elevated inflammatory markers and a more severe disease course in CD patients ([37-38]). Although 'MUST' is able to detect higher proportions of malnutrition risk compared to BMI alone, basic anthropometry is insufficient to differentiate fat mass and lean body mass. In a prospective controlled study among IBD patients, despite 74% of IBD patients having a normal BMI, handgrip strength and lean body mass was impaired in both CD and UC patients *(*[39]). More than half of IBD patients were found to have muscle mass depletion despite a normal BMI ([40]) as IBD not only causes weight change it also alters body composition. Assessment of body composition in addition to simple anthropometry would better indicate nutritional status in IBD patients.

Specific micronutrient deficits, loss of body cell mass and muscle strength often persist even in disease remission and would not be detected by standard malnutrition screening alone ([39]). In the IBD cohort it may not be possible to fully evaluate malnutrition risk based solely on malnutrition screening, due to the complex nature of the disease.

The Bioelectrical Impedance Analysis (BIA) is a measure of body composition that can be used to differentiate between fat and fat free mass and is also a predictor for nutritional status ([40]). BIA is used in clinical settings as it is considered to be non-invasive, no technical skill is required and it is comfortable for patients compared to other methods. However, BIA is expensive and time consuming and due to time and staffing constraints in a busy outpatient setting a more economic and practical measurement of body composition is required.

Tricep Skinfold thickness (TSF) is the most frequently used method for assessment of body composition as it is cheap and feasible. Body fat can be predicted by the sum of skinfold thickness from different parts, as the total body fat correlates with subcutaneous fat ([41]). TSF has been found to correlate well with BIA in a study which evaluated the body fat estimated by BIA and TSF on

348 undergraduate students and concluded that the anthropometric method can surrogate fat mass % and assess body fat when BIA is unavailable ([42]). The addition of TSF may be useful to support 'MUST' in identifying malnutrition risk in the IBD patient cohort. However, the acceptability of this additional measure in the IBD patient group would require further testing in clinical practice.

Implications

Implementing 'MUST'-P could potentially reduce the workload demands on HCP's to screen patients for identification of malnutrition risk of patients in the outpatient setting. Furthermore, the use of self-screening has the capacity to promote patient involvement in their own care. However, due to the complex nature of IBD there are concerns that using a generic malnutrition screening tool may not capture all patients at malnutrition risk. It may be that screening in the community is a more appropriate setting for 'MUST' where rates of under-recognised and under-treated malnutrition are known to be high ([35]). Patients could be advised to use the web-based malnutrition self-screening tool based on 'MUST developed and available on the BAPEN website ([35]) which is designed to help adults to identify their own risk of malnutrition in the community.

Recommendations for further research

In order to be able to generalise these findings to the wider IBD population, larger studies are required in different UK hospital outpatient settings.

The use of HCP led focus groups could be used to explore perceptions of 'MUST'-P and help to identify the potential barriers and facilitators of its use develop the tool further and improve its accuracy and validity. To enable successful implementation of 'MUST'-P in the outpatient setting, appropriate and practical malnutrition care pathways would need to be developed so that those identified as malnourished are appropriately managed and treated. However, dietetic resourcing available for those patients identified at high risk may be a limiting factor.

Limitations

Test-retest reliability was performed both by Cawood et al ([27]) and McCurk et al ([25]) in order to compare the accuracy of two different self-screening scores. Similar to the work of Sandhu et al ([22]), this study did not perform test-retest reliability as there would be a short duration of time between baseline 'MUST'-P and repeat screening and it is highly likely the patients would recall their baseline score, potentially introducing reporting bias. Only 3 patients approached refused to complete 'MUST'-P indicating a high response rate. The sample size of 80 compares favourably to other studies in IBD cohorts ([20]). A limitation of the validity of the study was that due to the low numbers of patients with active disease, it was not possible to assess whether there was a significant relationship between disease activity and 'MUST' score. The results of our study correlate well with a previous larger study in a similar patient cohort ([22]). However, the results of our study cannot be generalised to the wider population due to the small sample size which was restricted to a single UK based large tertiary hospital.

Conclusions

This study confirms previous findings that suggest 'MUST'-P is a quick and easy method of nutritional screening for use in a busy outpatient setting. Moderate agreement was found between 'MUST'-HCP and 'MUST'-P with the strongest agreement for medium and high risk patients. Although the overall malnutrition rates were found to be low, not all patients recognised as at high risk of malnutrition by 'MUST'-HCP were referred to the Dietitian. Furthermore, due to the complexity of nutritional issues specific to IBD patients the use of a generic tool may risk missing patients deemed as low risk that may still require nutritional intervention. The authors recommend that to ensure all nutritionally at risk patients are identified, this tool is combined with measurement of body composition and consideration of micronutrient serum levels. Frequent and regular nutritional screening in all health care settings will allow the malnutrition risk to be identified early and be prevented or treated appropriately.

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‘**Transparency Declaration**’.

"The lead author affirms that this manuscript is an honest, accurate, and transparent account of the study being reported, that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained. The reporting of this work is compliant with STROBE guidelines."

Conflict of Interest Statement and Funding sources:

None declared.

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Figure and Table Legends

Table 1: Demographic and Clinical Characteristics of the study participants (total n=80).

Table 2: Comparison of malnutrition risks as identified by the MUST-P and the MUST-HCP (total n=77)

Table 1: Demographic and Clinical Characteristics of the study participants (total n=80).

Characteristic	**UC % (n) 36.2 (29)**	**CD* % (n) 61.3 (49)**	**Comparison of UC and CD P value**	**IBD-U 2.5 (2)**	**Total IBD cohort (n=80)**
Age: mean (SD) years	43.1 (16.2)	37.8 (14.6)	0.14	45 (5.7)	39.9 (15.1)
Gender (n,%)					
Female	14 (48.3)	23 (46.9)	0.91	2 (100.0)	39 (48.8)
Male	15 (51.7)	26 (53.1)		0 (0.0)	41 (51.2)
Time since diagnosis (n,%)			0.90		
≤ 10 years	17 (58.6)	28 (57.1)		2 (100.0)	47 (58.8)
>10 years	12 (41.4)	21 (42.9)		0 (0.0)	33 (41.2)
Well-being (n,%) **0 (very well)** **1 (slightly below average)** **2 (poor)** **3 (very poor)** **4 (terrible)**	0=11(37.9) 1=17(58.6) 2=1(3.5) 3=0 (0.0) 4=0 (0.0)	0=20 (40.8) 1=22 (44.9) 2=4 (8.2) 3=2 (4.1) 4=1 (2.0)	0.80	0=1 (50.0) 1=0 (0.0) 2=0 (0.0) 3=1 (50.0)	0=32 (40.0) 1=39 (48.8) 2=5 (6.2) 3=3 (3.8) 4=1 (1.2)
Height (m) mean (SD)	1.71 (0.09)	1.71 (0.08)	0.75	1.54 (0.11)	1.71 (0.09)
Weight (kg) mean (SD)	81.7 (20.9)	74.2 (19.5)	0.12	50.1 (9.3)	76.3 (20.4)
BMI (kg/m^2) mean (SD)	27.6 (6.0)	25.3 (5.8)	0.10	20.9 (1.0)	26 (5.89)
Area (n,%) Deprivation***					
Most deprived	23 (79.3)	24 (50.0)	0.01	1 (50.0)	48 (60.8)
Least deprived	6 (20.7)	24 (50.0)		1 (50.0)	31(39.2)

Data are presented as mean (SD), n(%), using unpaired t-test and Chi-square test to test for differences by IBD group. P-values represent differences between subgroups UC and CD only.
*including Crohn's Colitis
** Well-being variable was categorised as very well (score 0) versus all other scores (1-4) when compared by IBD group using the Chi square test
***Area deprivation variable includes n=1 missing value
Abbreviations: BMI, body mass index; IBD, Inflammatory Bowel Disease

Table 2: Comparison of malnutrition risks as identified by the MUST-P and the MUST-HCP (total n=77)

		Malnutrition Risk by MUST-P						**Total**
		Low		**Medium**		**High**		
		N	**%**	**N**	**%**	**N**	**%**	**N**
Malnutrition Risk by MUST-HCP	**Low**	49	74.2%	2	3.0%	15	22.7%	66
	Medium	0	0.0%	6	100.0%	0	0.0%	6
	High	0	0.0%	0	0.0%	5	100.0%	5
Total	49	63.6%	8	10.4%	20	26.0%		77