Opportunities for nutritional intervention in nutritionally vulnerable older adults an investigation of practice and evidence

Dabbous, Massar

Awarding institution:
King's College London

Opportunities for nutritional intervention in nutritionally vulnerable older adults: an investigation of practice and evidence

Massar Dabbous

A thesis submitted for the degree of Doctor of Philosophy

March 2022

Departments of Nutritional Sciences

Faculty of Life Sciences and Medicine

King's College London

Acknowledgements

I am extremely grateful for my two supervisors, Dr. Elizabeth Weekes and Dr. Christine Baldwin for all their guidance throughout the past four years of my PhD journey. They have been a source of great support, inspiration and immense knowledge and I am thankful for the opportunity to have worked with them both to develop my research career.

I would also like to thank my thesis committee team for their guidance along the way especially at the beginning as this thesis was coming into design. I am extremely grateful for the support provided by Professor Glenn Robert, as I learned and implemented the co-design methodology which has become a method I thoroughly enjoyed.

I am grateful for all the participants who took part in the interviews- to the falls clinic teams for giving their time and supporting the study and the service user participants for sharing their stories with me.

I am lucky to have friends who are like family scattered all across the world for their support, phone calls, reading through chapters, and breaks!

A huge thank you to my family for all their support along this rollercoaster of a journey. Thank you, dad, for being my best friend, my biggest cheerleader and the one always challenging me forward. Mom, you are always there for encouragement and motivation, I love you. Ameera, Dana, Woody (and Frankie of course) thank you for all the source of entertainment and stress-relief throughout this journey. I couldn't' have done it without you!

Lastly, I thank god for the strength and faith along this path.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ADL	Activities of Daily Living
BDA	British Dietetic Association
BCT	Behaviour Change Techniques
BCW	Behaviour Change Wheel
BI	Barthel Index
BMI	Body Mass Index
COPD	Chronic Obstructive Pulmonary Disease
CRAFs	Community Rehabilitation and Falls Services
EBCD	Experience Based Co-Design
EHR	Electronic Health Records
FTE	Full Time Equivalent
GLIM	Global Leadership Initiative on Malnutrition
GP	General Practice
HCP	Healthcare Professionals
IC	Intermediate Care
IMD	Index of Multiple Deprivation
MD	Mean Difference
MDM	Multidisciplinary Meeting
MDT	Multidisciplinary Teams
MNA	Mini Nutrition Assessment
MUST	Malnutrition Universal Screening Tool
NHS	National Health Service
NICE	National Institute for Health and Clinical Excellence
ONS	Oral Nutritional Supplements
ONS	Office of National Statistics
OR	Odds Ratio
OPAU	Outpatient Assessment Unit
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	International Prospective Register of Systematic Reviews
QOL	Quality of Life
ROB	Risk of Bias
SD	Standard Deviation
SOP	Standard Operating Procedures
TDF	Theoretical Domains Framework
TIDieR	Template for intervention description and replication
UK	United Kingdom
WHO	World Health Organization

Thesis Abstract

Background: An estimated one third (1.3 million) of individuals affected by malnutrition in the United Kingdom (UK) are aged 65 years and above, with 93% of total malnutrition cases arising in the community. Malnutrition in the older population is complex, with an interplay of different risk factors affecting its cause as well as its treatment. Evidence suggests that there are significant challenges in the identification and management of malnutrition across healthcare settings, in part due to relatively limited access to dietitians and the lack of clarity around the roles of non-dietetic healthcare professionals (HCPs). While dietitians possess the specialist skills to provide nutritional interventions, they have one of the lowest workforce numbers in the NHS making it difficult to tackle the malnutrition burden alone. There is a clear need for improved opportunities for recognition of nutritionally vulnerable individuals and the implementation of multi-disciplinary management pathways.

Aims: The aims of this thesis were to:

1. explore the nutritional care currently provided to nutritionally vulnerable older people in the community
2. establish whether non-dietetic healthcare professionals (HCPs) can provide effective nutritional care to nutritionally vulnerable older people and
3. to suggest potential strategies to improve the nutritional care of people accessing falls services.

Methods: This research project focused on the development phase of the MRC framework for the design of complex interventions through undertaking four studies. In the first stage, (1) An observational, cohort study was undertaken from a subset of participants from an existing observational cohort study, NUTRICOM (*The Impact of Nutrition Risk Status on Older People in the Community*) and data from electronic health records (EHR) was collected and analysed to explore and describe the associations between nutritional risk status and the number of contacts in hospital and community settings, healthcare professionals and the documented nutritional care currently provided to nutritionally vulnerable older people in the community (2) A systematic review was conducted to identify and evaluate the current clinical trial evidence on the effectiveness of nutritional care interventions provided by non-dietetic HCPs on patient outcomes. The types of nutritional interventions provided, the professions delivering the interventions, and the settings the interventions are provided were identified. Additionally, the descriptions and completeness of nutritional were assessed using the TIDieR checklist. In the second stage, (3) A cross-sectional survey was conducted to identify current nutritional care practices within multi-disciplinary

falls prevention services (4) Lastly, using data generated from studies 1-3, a qualitative study was conducted using semi-structured interviews to capture older adult service, users and HCP perceptions and experiences of nutrition services to explore current service provision, and to suggest potential nutritional care interventions for integration within multidisciplinary falls prevention services.

Results: In this project, the complex nutritional care needs of nutritionally vulnerable older adults in the community were identified and described.

In study 1: Results highlighted the numerous key contacts this cohort has with HCPs and healthcare services, and the missed opportunities for the detection and management of nutritional issues. During the study period, the group at high nutritional risk had higher risk of contact with hospital and community services and professionals than the group at low nutritional risk. Documented nutritional care appeared to be one-off and ad hoc rather than systematic, resulting in missed opportunities for identification and management of malnutrition. No association between the nutritional risk groups were demonstrated for nutritional documentation. Overall total healthcare contacts and documented nutritional care were greater in hospital contacts versus community contacts.

In study 2: Evidence for the potential role of non-dietetic HCPs to be effective in providing nutritional management to patients at nutritional risk was also identified. 18 eligible studies were included and interventions were grouped into three categories: feeding assistance, nutritional care plans and multi-factorial interventions. The very low and low-quality evidence highlighted mixed effects on outcomes. Assessment from the TIDieR checklist highlighted incomplete reporting of the nutritional interventions.

In study 3: Findings from 63 falls service respondents indicated a lack of policy on nutritional management within falls services in England and limited inclusion of routine nutritional care practices. Nutritional screening was a “one-off” procedure, with only 10% respondents reporting re-screening during contact with their service. The bulk of nutritional care was provided by physiotherapists or nurses.

In study 4: Findings from 14 multidisciplinary HCPs, 14 service users and one carer highlighted shared themes and improvement priorities among the HCPs and service users within outpatient and community falls services. These themes include ‘the patient is a complex story, but is nutrition part of it?’, ‘everyone’s job, but no one’s responsibility’, and ‘is the dietitian invisible?’. Intervention strategies addressing key

barriers and for the integration of nutritional care the services were suggested by participants.

Conclusions: This thesis highlights the missed opportunities for identification and management of patients at nutritional risk and the need for innovative strategies to improve the detection and management of malnutrition in the community to alleviate the burden of management of malnutrition on dietetic services and "make every contact count". The study, based on HCP and service user interviews provides a premise for the involvement of non-dietetic HCPs in the identification and first-line management of malnutrition. This thesis concludes by proposing nutrition intervention strategies for the integration of nutritional care in falls prevention services based on HCPs and older adult service users. Future research is needed to explore the feasibility of the suggested interventions in both multidisciplinary healthcare teams and older adults within falls prevention services.

COVID-19 Impact Statement

During the final stages of this PhD thesis, the COVID-19 pandemic began which impacted some data collection in the final study (chapter 6) of the thesis. The final study was originally developed utilising the Experience Based Co-design (EBCD) process aiming to co-design nutritional intervention strategies in falls prevention services within an NHS Trust (hospital and community settings). Ideally within the EBCD process, stages of data collection involve observations and interviews, followed by conducting individual and joint feedback and co-design workshops with service user and HCP participants (group format). By March 2020, when the pandemic began, I had completed conducting observations and interviews, where the next stages were data analysis followed by conducting the feedback events with participants (service users and HCPs). All studies on site were paused for data collection and research was restricted within the hospital and university. Services were restructured and several HCPs were re-deployed. As a result, (1) two service user participants could not conduct a follow up meeting to validate their video clips and consent to video-release and (2) individual feedback events with the service users and HCPs and joint co-design workshops could not be held.

In fall 2020, NHS trust policies began lifting research restrictions based on research priorities. I communicated with HCPs within the outpatient hospital and community falls services and the service user participants to discuss updates and feasibility of the next stages (feedback and co-design workshops). While there was interest to continue the study by both the HCPs and service users, there were significant changes to falls service structures, some HCPs were still re-deployed, some service user participants were shielding and some travel restrictions remained in place. These changes resulted

in the decision to write up and submit an amendment to the original NHS ethics protocol to re-structure the events into an online virtual formal, which included updating study documents and consent procedures. However, delays to receiving a response for approval of the amendment did not align with the timeline of the thesis. Therefore, in this final version of the PhD thesis, the individual and joint feedback events with HCPs and service users and co-design workshops did not take place.

The key aims of these feedback events were to present and discuss themes (feedback) and choose the improvement priorities highlighted from the interviews, watch and discuss the 'trigger' film created from service user video interviews, and collaborate and model nutritional intervention strategies for integration and re-design within falls prevention services. The original process is described below:

1. Inclusion of of 25-30 min trigger film
2. *Service & carer individual feedback event:* Discuss the 25-30 min film and agree on the 'touch points' (crucial moments) to be fed back to the HCPs at a joint feedback event for improvement.
3. *HCP individual feedback event:* Present and discuss the common themes portrayed from the interviews to be shared with service users.
4. *Joint HCP and patient/carer feedback event(s):* More than one (approximately 1-3) joint service user, carer and HCP feedback and co-design workshops to show and discuss the trigger film, share thoughts, and discuss, model and prototype strategies for intervention plans to improve the nutrition service based on the emerged touch points of the film. Stakeholders and commissioners associated with the falls services, and dietitians were to be invited to join the joint feedback event(s).

Therefore, key adaptations made to the methods in Chapter 6, involved focusing on the qualitative data from the service user, carer and HCPs interviews from the thematic analysis. Improvement priorities and nutritional intervention strategies were suggested from participant interview data keeping the integrity of a collaborative approach. A

trigger film was created but not included within the final thesis, as it is beyond the scope of the adapted methods. Thus, only data from the participant interviews are presented within Chapter 6 of this PhD thesis and concludes by suggesting nutritional intervention strategies which may be piloted and implemented within falls services in the future.

Statement of Contribution

Chapter 3: For this thesis, the health record data of a subgroup of participants recruited into a previous study (NUTRICOM) study who had specifically consented to their healthcare records was reviewed and accessed. The baseline data for these participants had already been collected as part of the original study. I conceptualised and designed Electronic Health Record (EHR) method within the cohort study subset and conducted all aspects of the data collection from the health records, analysis and write up.

Chapter 4: One manuscript has been developed from this chapter which involved working with one student independently as part of their undergraduate research projects whom I co-supervised. This allowed for duplication of the study selection and data extraction process. This chapter explores the effectiveness of nutritional intervention strategies delivered by HCPs. I designed the study, developed the search strategy and conducted the searches, data extraction and write up for both the HCPs. Rebecca Hastings (RH) developed the strategy focused on the HCP population, conducted database searches on selected databases, and data extraction, I drafted the write up of this manuscript which included data from RH.

In addition to my role, a second student, Tamsin Thompson (TT) was involved in evaluation of the interventions within this review utilising the TIDieR checklist as part of her undergraduate research project, whom I co-supervised. TT contributed to the development of the protocol for the checklist and the inter-rater reliability of the assessment, as a second reviewer.

Chapter 6: A second independent researcher, Teresa Anne Day (TD) along with my supervisor Elizabeth Weekes (CEW) contributed to the validation of a proportion of the interview transcripts (10% of transcripts each), through conducting thematic analysis. I conducted analysis and study procedures of all transcripts.

List of Publications and Abstracts

Publications

Dabbous, M., Baldwin, C., & Weekes, C. E. (2021). Nutritional Care Practices in Falls Prevention Services across England (*In Press*)

Dabbous, M., Hastings, R., Weekes, C. E., & Baldwin, C. (2021). The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: a systematic review. *Clinical Nutrition.*

Latif, J., **Dabbous, M**., Weekes, C. E., & Baldwin, C. (2020). The effectiveness of trained volunteer delivered interventions in adults at risk of malnutrition: a systematic review and meta-analysis. *Clinical Nutrition*.

Conference Abstracts

Dabbous, M., Baldwin, & C Weekes, C. E. (2020) Nutritional Care Practices in Falls Prevention Services (Conference Abstract, British Geriatrics Society)

Dabbous, M., Baldwin, & C Weekes, C. E. (2020) Nutritional Screening in Falls Prevention Services *e-SPEN Clinical Nutrition* (Conference Abstract, ESPEN)

Dabbous, M., Weekes, C. E., & Baldwin, C (2019) The effectiveness of nutritional interventions provided by non-dietitians on functional outcomes in adults at risk of malnutrition: A systematic review. *Journal of the Academy of Nutrition and Dietetics.* (Conference Abstract, FNCE)

Dabbous, M., Baldwin, C & Weekes, C. E. (2019) **Nutrition risk status and documented nutritional care in older people accessing intermediate care and general practice services**. *e-SPEN Clinical Nutrition.* (Conference Abstract, Poster of Distinction & Nominee for the Professor RG Clark Award, BAPEN) *****

Dabbous, M., Weekes, C. E., & Baldwin, C (2019) A systematic review of the effectiveness of nutritional interventions provided by non-dietitians on nutritional outcomes in adults at risk of malnutrition. *e-SPEN Clinical Nutrition* (Conference Abstract, ESPEN)

Dabbous, M., Baldwin, & C Weekes, C. E. (2019) Review of nutritional care provided to older adults in the community. *e-SPEN Clinical Nutrition* (Conference Abstract, ESPEN)

Chapter 1: Introduction

1.1 Background

1.1.1 Definition and prevalence of malnutrition

Malnutrition, a common health concern in an ageing population, has been defined as undernutrition that is characterised by a deficit of energy and nutrients causing a decline in function and poorer clinical outcomes (Margetts et al., 2003). Malnutrition is estimated to affect three million people in the United Kingdom (UK), 93% of whom live in the community (Elia & Russell, 2009) and1.3 million are aged 65 years and above (BAPEN, 2018). The commonly used terminology "at risk of malnutrition" can be defined according to the European Society of Parenteral and Enteral Nutrition (ESPEN) criteria as the "state prior to the diagnosis of malnutrition" based on fulfilling a nutritional criterion from a validated nutritional risk screening tool. These two criteria include: either reduced body mass index (BMI) <18.5 kg/m^2 (as per WHO), or combined weight loss and reduced BMI (Cederholm et al., 2017). "Nutritional screening" is the process used to identify individuals at nutritional risk, performed using a validated tool when in contact with healthcare services (Cederholm et al., 2017) and is the first step of the nutritional care pathway for the management of malnutrition described in further detail below (section 1.1.4).

Prevalence of malnutrition using the Malnutrition Universal Screening Tool (MUST) in the UK found that 30% of adults are at risk of malnutrition on hospital admission (**Figure 1.1**). The prevalence was highest amongst older adults (aged 65+), of which 34% of older adults living in their own homes were found to be malnourished on hospital admission (Elia, 2015). National screening surveys have also highlighted that the prevalence of malnutrition (medium or high risk of malnutrition) varies between

settings in UK adults, figure 1.1 (BAPEN, 2014). While most of the burden falls within care homes, these screening surveys also highlight that the primary source of admission to hospital is from the community setting (BAPEN, 2014).

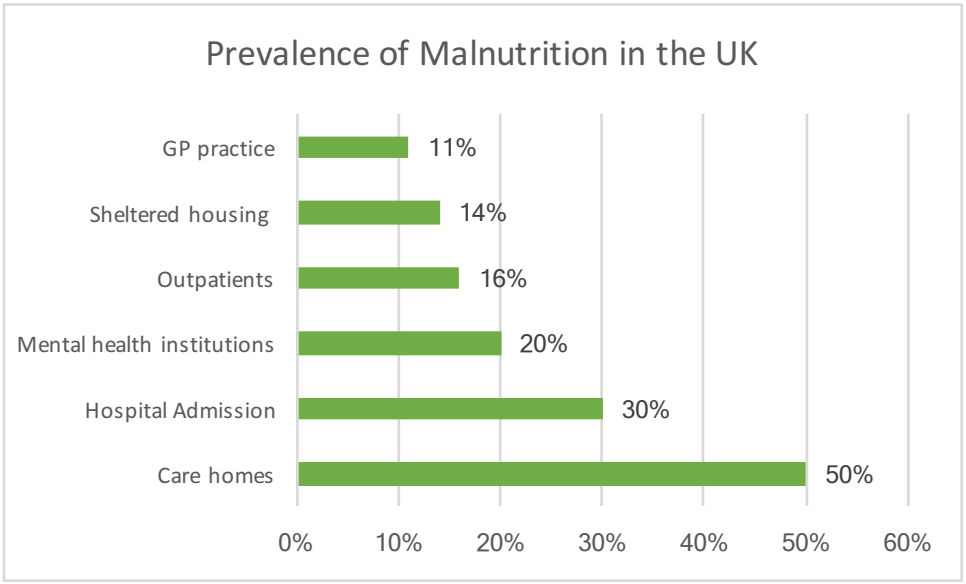


Figure 1.1: Prevalence of malnutrition in the UK based on nutritional screening surveys (BAPEN, 2014)

There is a lack of consensus on the diagnostic criteria and "gold standard" screening tool for identifying malnutrition in clinical practice. This results in discrepancies in identifying the true prevalence of malnutrition (undernutrition) in the community and may result from the use of different measurement tools, diagnostic criteria and study designs. A recent systematic review and meta-analysis explored the prevalence of malnutrition across different settings using the Mini Nutritional Assessment (MNA) tool in older adults (n=240 studies, 113, 967 participants). The authors found significant differences in prevalence between healthcare settings ranging from 29.4% in hospital to 3% in the community (Cereda et al., 2016). Despite using a single tool, this review highlighted the high heterogeneity amongst included studies, which could result from variations in sample size, characteristics of the older adult population (gender, clinical background, aetiology of malnutrition), and professionals responsible

for completing the assessment (Cereda et al., 2016). Recently, the Global Leadership Initiative on Malnutrition (GLIM) proposed criteria to standardize the measurement of malnutrition, however further validation is needed across healthcare settings and population groups before its widespread use (Cederholm et al., 2017; Cederholm et al., 2015).

1.1.2 Risk factors and determinants of malnutrition

The aetiology of malnutrition is complex, acting as both cause and consequence of disease. Healthy ageing can be defined as "the process of developing and maintaining functional ability (e.g. meet basic needs, be mobile, contribute to society) that enables wellbeing in older age" (Michel et al., 2021). Biological changes on a cellular level, development of disease (acute and chronic) and social factors such as loneliness can all contribute to decreased physical and mental capacity with age (WHO., 2015).

The causes of malnutrition amongst older adults are multifactorial and may result from a combination of dietary, physiological, psychological, social and economic factors, which may accompany the ageing process. A summary of the associated factors from three recent systematic reviews are highlighted in **Figure 1.2** (Fávaro-Moreira et al., 2016; Maseda et al., 2018; O'Keeffe et al., 2019). The majority of studies providing evidence on the risk factors for malnutrition have been primarily cross-sectional (van der Pols-Vijlbrief et al., 2014; Vanderwee et al., 2010; Verbrugghe et al., 2013) making it difficult to elucidate cause and effect.

Two of these systematic reviews (Fávaro-Moreira et al., 2016; O'Keeffe et al., 2019) assessed risk factors and determinants for malnutrition in older adults across all settings from cohort studies only (figure 1.2). In one review, six cohort studies were included (Fávaro-Moreira et al., 2016). In the second review, 23 cohort studies were

included and several of these risk factors were also recognised as modifiable determinants of malnutrition (O'Keeffe et al., 2019). These included hospitalisation, eating dependency, poor self-perceived health and physical function as well as appetite (O'Keeffe et al., 2019). However, the limitations of these two reviews resulted from reporting outcome data from individual studies only within the review rather than a pooled analysis, due to the inter-study variability in the measurement and reporting of outcomes. Additionally, limitations of observational studies include the inability to demonstrate causality over time and exposure of the data to confounders which make it difficult to infer which factors may truly cause an effect. More recently, a third systematic review attempted to explore the social and economic factors related to malnutrition in older adults, which included a meta-analysis (Besora-Moreno et al., 2020). However, 36/40 studies within this review were cross sectional studies. Therefore, there is a limited ability to make inferences on associations between variables for the majority of outcomes. Additionally, exploring each factor in isolation fails to capture the links between them which might be addressed in a multifactorial analysis.

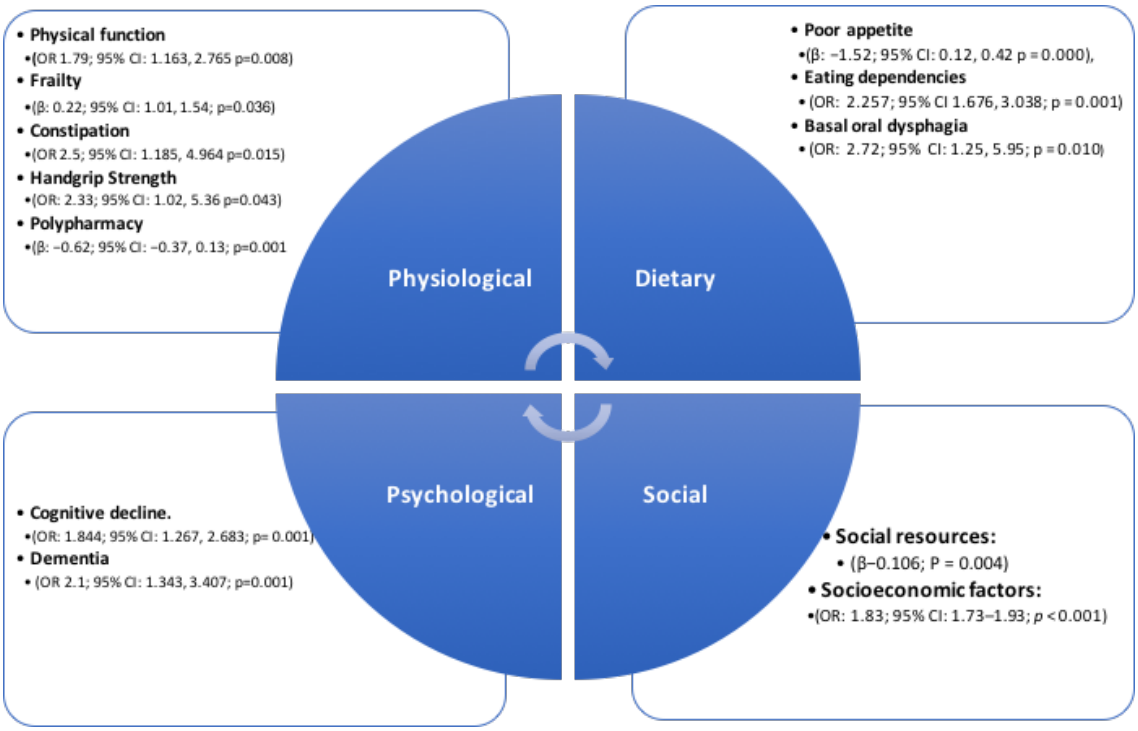


Figure 1.2: Risk factors for malnutrition among older adults (Fávaro-Moreira et al., 2016; Maseda et al., 2018; O'Keeffe et al., 2019; Stratton & Elia, 2006)
OR: Odds ratio; β, standardized regression coefficient

1.1.2.1 Physiological factors

Among the physiological factors associated with malnutrition are frailty, functional decline (including walking down stairs), polypharmacy, constipation and decreased handgrip strength (Fávaro-Moreira et al., 2016). A decline in physical function was associated with a 79% higher odds of developing malnutrition, figure 1.2. Furthermore, an increase in frailty was found to be a predictor of greater weight loss amongst institutionalised older adults (β: 0.22; 95% CI: 1.01, 1.54; p = 0.036). Baseline oral dysphagia and swallowing difficulties were associated with malnutrition risk (figure 1.2). This may be considered a cycle where dysphagia can influence malnutrition, leading to a decline of functional and muscle capacity and in turn impacting dysphagia (Fávaro-Moreira et al., 2016). However, mixed evidence was demonstrated by O'Keefe et al., 2019, possibly due to the multifaceted nature of dysphagia where many factors (e.g. physiological) could also influence this risk factor

(O'Keeffe et al., 2019). Additionally, a decreased handgrip strength (>5%) among men with dysphagia was associated with double the odds of developing malnutrition (OR: 2.33; 95% CI: 1.02, 5.36; p = 0.043). However, O'Keefe et al. (2019) showed inconsistencies in the associations between polypharmacy and malnutrition, which may be in part due to the lack of consistency among studies regarding how many medications were considered "polypharmacy". However, the limitations of these observational studies highlight the difficulty in separating which of the combination of factors may be causing an outcome effect. For example, individuals at high risk of malnutrition may have more medical conditions, and thus be prescribed more medications. Similarly, it is difficult to infer a causal relationship between frailty and weight loss (Laur et al., 2017).

1.1.2.2 Psychological factors

Psychological risk factors associated with malnutrition include a decline in cognition (e.g. dementia) and poor self-reported health status. A decline in cognition was associated with an 80% increased odds of developing malnutrition, while dementia was associated with double the odds of developing malnutrition (figure 1.2). Several factors may result in decreased food intake amongst older individuals with decreased cognition or dementia. These factors include dysphagia (Takahashi et al., 2019), inability or refusal to eat (Wang et al., 2016), or behaviours which may increase energy requirements (Sergi et al., 2013). Depression was also explored, however mixed results were highlighted for depression as a determinant or risk factor of malnutrition (Fávaro-Moreira et al., 2016, O'Keeffe et al., 2019).

1.1.2.3 Dietary factors

Dietary risk factors include difficulty swallowing (section 1.1.2.2), eating dependency and poor appetite (Fávaro-Moreira et al., 2016). Loss of appetite among older community-dwelling individuals was also negatively associated with malnutrition (β: −1.52; 95% CI: 0.12, 0.42; p = 0.000), which was highlighted as an association and determinant of malnutrition in both reviews (Fávaro-Moreira et al., 2016; O'Keeffe et al., 2019). Other oral issues such as dentures, gum issues (e.g. periodontal disease) and chewing difficulties may also be determinants of malnutrition common among the older population. However, findings differed for these risk factors in the review by O'Keefe et al. (2019), possibly as a result of the high comorbidities among the population groups, where it may be difficult to isolate the individual confounding factors.

1.1.2.4 Social factors

Loneliness has been identified as a predictor of malnutrition risk in older adults, suggesting the potential impact of improving community social support within this population. A cross-sectional study of community based older adults (n=749 participants) showed an increased risk of malnutrition assessed by the MNA tool among participants with impaired social resources (e.g. loneliness and lack of social support), indicated by a significant negative correlation between social resource rating (social resources: combined loneliness and lack of social support factors together) and MNA scores (r=-0.106; p=0.004) (Maseda et al., 2018). In a meta-analysis of mainly cross-sectional studies (Besora-Moreno et al., 2020), increased malnutrition and the risk of malnutrition in the elderly was associated with a lower educational level, living alone, being single, widowed, or divorced, and having a low-income level combined

(OR: 1.83; 95% CI: 1.73–1.93; $p < 0.001$; $I^2 = 94\%$; $p < 0.001$) and individually (Figure 1.2). However, there was substantial heterogeneity likely resulting from the use of varied tools and definitions to evaluate malnutrition or malnutrition risk. Similarly, socio-economic factors were evaluated using different tools and studies included the general population (healthy and ill), all of which may have contributed to the high level of heterogeneity within the meta-analysis.

"Anorexia of ageing" as a term has been coined to describe the decrease in food intake which may result from these multifactorial risk factors (e.g. physiological decline in taste and smell, poor oral health and dysphagia, effects of polypharmacy, cognitive decline, social isolation) as well as the increased resting energy expenditure (REE) frequently associated with acute diseases (Dent et al., 2019; Perna et al., 2019). With the increase in REE, this is often accompanied by reduced physical activity during illness which can further result in loss of muscle mass and an impact on total energy expenditures (Amarya et al., 2015). Together, these factors may escalate the risk of malnutrition and highlight the complexities involved in its development amongst older adults (Dent et al., 2019; Perna et al., 2019).

In these three reviews (Besora-Moreno et al., 2020; Fávaro-Moreira et al., 2016; O'Keeffe et al., 2019), most of the risk factors and determinants come from moderate to low quality studies that were heterogeneous for assessments, study design and reported outcome variables. Although systematic reviews of randomized control trials (RCTs) are needed to increase the quality of evidence, to compensate for the limitations of observational studies assessment of the aetiological factors leading to development of malnutrition is not necessarily amenable to being studied in RCTs. Nevertheless, understanding the key risk factors for development of malnutrition

highlights a need for a multifactorial approach to address malnutrition amongst the older population. Systems for detection and management that can operate within complex service structures are also needed.

1.1.3 Impact of malnutrition

Malnutrition has multiple effects on both the overall health and outcomes of illness in individuals. It also has adverse effects on a range of health and social care-related outcomes.

1.1.3.1 Impact on the individual

Compared to healthy individuals, older adults admitted to hospital at risk of malnutrition are twice as likely to visit their GP, spend twice as long in hospital (28 days vs. 15 days, respectively), and have an increased risk of mortality (31% vs 14%, respectively) (Guest et al., 2011; Stratton et al., 2006). Additionally, older adults at nutritional risk have a poorer quality of life (QOL) and decreased functional activity (e.g. activities of daily living (ADLs)), increased risk of falling, developing infections and new co-morbidities, as well as worsening of existing illness compared to well-nourished individuals (Izawa et al., 2014; Rasheed & Woods, 2013).

1.1.3.2 Impact on health and social care

Alongside the effects on an individual's health, malnutrition results in greater costs to society, with the estimated costs to health and social care budgets of managing malnourished individuals in the UK in 2011-2012 of £19.6 billion (Elia, 2015). The treatment costs for malnourished individuals have been estimated to be approximately double those of well-nourished individuals with the older population (aged ≥ 65 years) accounting for approximately half of the costs of managing malnutrition in

both primary and secondary health and social care settings in the UK (Elia, 2015). Whilst most costs are incurred in hospital settings, it is estimated that only 2% of malnourished individuals are in hospital at any one time (Elia, 2015).

Furthermore, while hospital malnutrition is associated with poorer outcomes in terms of complications, discharge destination and support needs, the greatest burden of malnutrition is likely in the community. With a population of 66 million in the UK and assuming 12 million are greater than 65 years, there is a challenge to identify and effectively manage the 1.3 million malnourished individual aged more than 65 years (AGE UK, 2019). Effective screening, prevention and treatment are essential across all settings to break the cycle of malnutrition and decrease the burden on individual and health and social care costs (BAPEN, 2019).

1.1.4 Management of malnutrition and the nutritional care pathway

1.1.4.1 Nutritional Screening

Guidance pathways have been developed by professional organisations for the management of malnutrition such as the National Institute of Clinical Excellence (NICE) and British Dietetic Association (British Dietetic Association, 2020a; NICE, 2006). Nutritional screening is usually the first step recommended in this process to identify participants at nutritional risk and determine subsequent management and whether onward dietetic referral is warranted and nutritional support is needed. The NICE guidelines on nutritional support for adults recommend that screening pathways be developed and implemented by all healthcare professionals (HCPs) in hospital inpatient, outpatient and community settings using a validated screening tool (e.g. MUST) (NICE, 2006).

Once nutritional screening occurs, malnutrition is recognised by further nutritional assessment. The subsequent steps of the management pathway can occur, identified as, nutritional assessment to relate malnutrition to its aetiology, followed by planning and implementation of a nutritional treatment or intervention (oral interventions, enteral and parenteral feedings) by a specialist dietitian to target the nutritional problem and improve nutritional status. While performing nutritional screening primarily involves training to use a tool, nutritional assessment requires using skills to gather information from a range of sources and making judgements about nutritional risk as well as the most appropriate first-line management (British Dietetic Association, 2020a). Monitoring and evaluation of the intervention outcomes are the final stages of the pathway of nutrition care, where monitoring can also be performed by all HCPs if provided with relevant training and clear processes and action plans, **Figure 1.3**.

However, while nutrition screening tools aim to be quick and easy to use, the majority of screening tools don't provide guidelines on the actions needed for follow up (Omidvari et al., 2013). Therefore, in practice this may contribute to lack of appropriate referral and management. Evidence has highlighted that, nutritional screening alone is not sufficient to improve patient outcomes and should be accompanied by appropriate referral pathways (Weekes et al., 2009). Thus, strategies for identification, first-line management and onward referral for individuals at nutritional risk are needed.

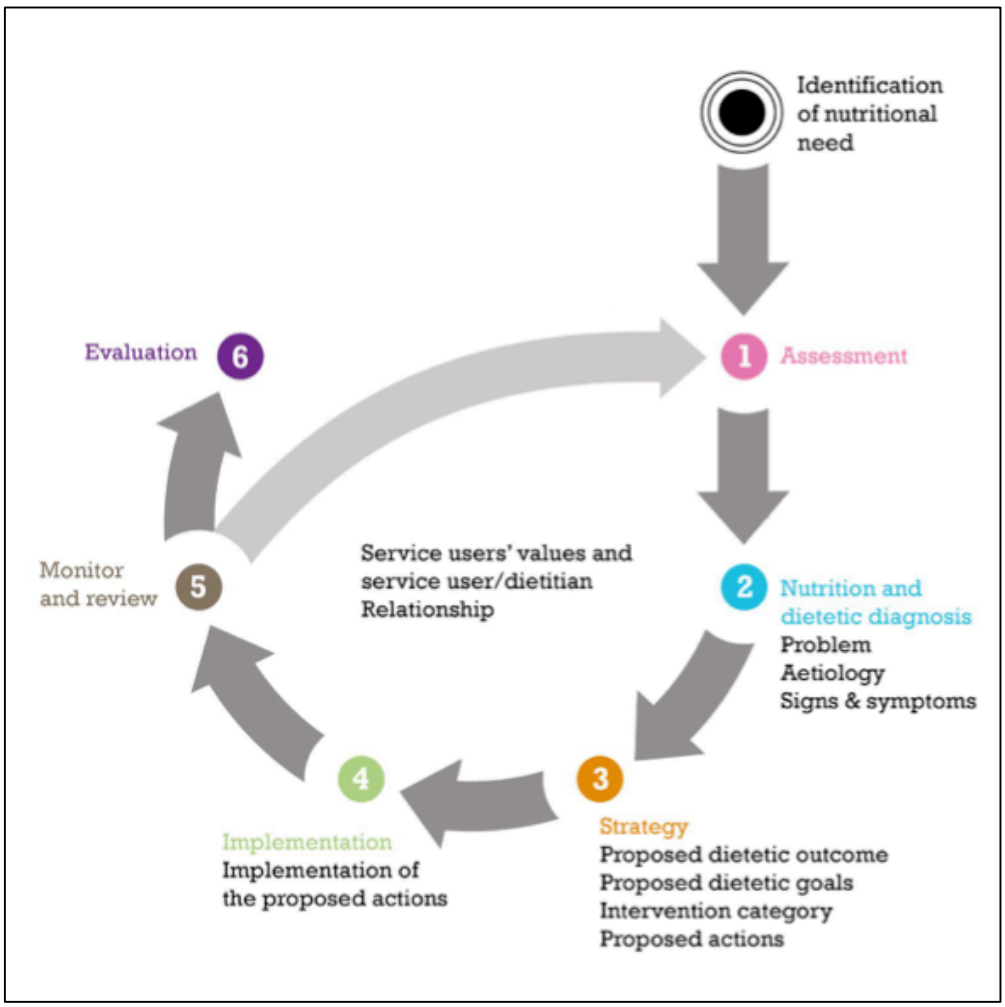


Figure 1.3 Nutritional care process and model (British Dietetic Association, 2020a)

1.1.4.2 Unrecognised nutritional risk

Despite the availability of guidance, evidence suggests malnutrition continues to be unrecognised and untreated across healthcare systems. Studies have shown that both nutritional screening and subsequent referral to dietitians by HCPs is frequently inadequate (Baldwin et al., 2006; Stratton & Elia, 2006; Suominen et al., 2007; Watterson et al., 2009). Evidence of suboptimal nutrition screening has been highlighted throughout different healthcare systems across the UK, Europe, and Australia, with most studies focused on the hospital settings (Farrer et al., 2014; Kondrup et al., 2002; Porter et al., 2009). Failure to identify malnutrition risk was

observed in a cross-sectional study in older adults within residential care. Of the 57% of older adults who were malnourished assessed by the research nurses using the MNA screening tool, malnutrition was detected in only 15% of those through routine nutritional screening by nurses (Suominen et al., 2009). The discrepancy in the detection of malnutrition may be a result of lack of awareness by the nurses or a lack of guidelines or policies implemented in practice within the institution. In the UK, similar results were observed within elderly care wards (n=3 with fewer than 60% of patients having a documented nutrition screening on admission in accordance with NICE guidelines (Farrer et al., 2014). This evidence again re-iterates the importance of pathways of care for both detection and management of malnutrition.

Evidence is limited within the community setting, in a systematic review of 54 studies, Hamirudin et al. (2016), explored the amount of nutritional risk in older adults identified through nutritional screening in the community (Hamirudin et al., 2016). Results highlighted a wide variation from 0% to 83% of community-dwelling older adults categorised as at-risk of malnutrition (Hamirudin et al., 2016). The studies included within these reviews differed in the nutrition screening tool used, contributing to the variation in risk identification. Eleven different tools were identified, which varied in the items within the checklist and score indicators contributing to disparity in risk identification. Additionally, the populations included also varied. Some studies included frail homebound older adults receiving healthcare services, thus maybe at increased nutritional risk (Hamirudin et al., 2016).

1.1.5 Healthcare professionals at the frontline

1.1.5.1 First-line nutritional identification and management

The role of dietitians is important in ensuring nutritional care is addressed and managed amongst those at risk of malnutrition. Dietitians are professionally trained in the specialist skills needed to make detailed assessments that inform interventions and for the provision of nutritional support for complex patients and environments (British Dietetic Association, 2020a).

While dietitians work at the frontline of care, there is the challenge of relatively lower dietetic staffing numbers, **Figure 1.4**, with only 4109 registered dietitians (based on Full Time Equivalents (FTEs)) within the NHS working across different specialities and populations (NHS Digital, 2018a). These workforce numbers are too low for dietitians to identify, assess and manage all patient who might be at risk of malnutrition on their own. With greater staffing numbers amongst nurses, physicians and other AHPs, many of whom have frequent contacts with patients, a potentially greater role exists for non-dietetic HCPs in the identification, first-line management and onward referral of nutritionally at-risk patients.

Furthermore, dietitians are often not included as part of multi-disciplinary teams that manage populations where risk of malnutrition might be high (e.g. elderly care, COPD, falls). The general model of dietetic services is a centralised service where dietitians largely operate through receipt of referrals from other HCPs recognising the need for a patient to see a dietitian (British Dietetic Association, 2020a; NICE, 2006). However, there is an opportunity to provide a model of integrated care, where the dietetic services can be integrated into a multidisciplinary team (Lindner-Rabl et al., 2022).

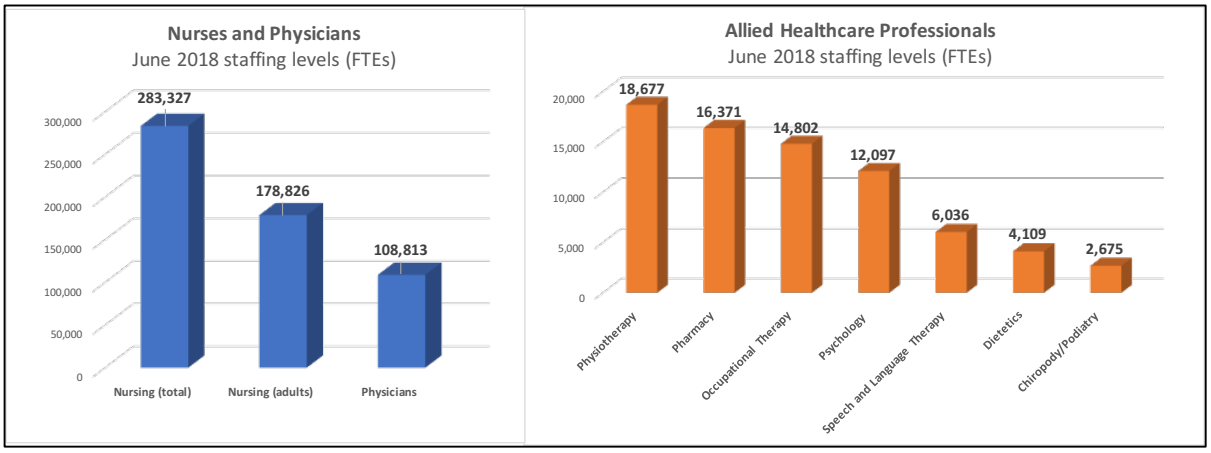


Figure 1.4: Staffing levels of healthcare professionals within the NHS (June 2018) according to professional groups.

Malnutrition can arise at any time and at any stage in a patient's disease pathway, requiring timely and effective identification and treatment. Older adults may have a number of medical, social and psychological issues that could affect their nutritional status and have contacts with many health and social care professionals however, most of these contacts are unlikely to be with dietitians (Marshall et al., 2013; Rist et al., 2012). For example, the older adult may have multiple diseases such as dementia, and/or chronic obstructive pulmonary disorder (COPD) that affect their nutritional status, resulting in the need for complex and integrated care (Liu et al., 2014; Saka et al., 2010; Slinde et al., 2002). One cross sectional study of hospitalised older adults (n=374) illustrated that nutritionally at-risk individuals were more likely to have dysphagia and thus be seen by a speech and language therapist (Eglseer et al., 2018).

Furthermore, older adults primarily seek contact with GPs for care, as well as outpatient and community teams compared with hospital admissions (NHS, 2019). 11% of individuals attending GP and 15% of individuals within outpatient clinics were at risk of malnutrition (figure 1.1). Older adults in the community may also be

receiving home care services by nurses or informal caregivers, who are in a position to identify the presence of malnutrition (Marshall et al., 2013; Rist et al., 2012). As part of the NHS Long Term Plan, there is a strong focus on uniting community and discharge support networks aimed at addressing the workforce capacity challenges within community services and improving patient support within the community (NHS, 2019). Furthermore, there is an initiative for supporting individuals to age well by providing community support to enhance health outcomes (NHS, 2019). This includes integrated primary and community systems aiming to maintain independence and decrease hospital admissions through cost effective falls prevention schemes(NHS, 2019). This presents an opportunity for improved strategies for identification and first-line nutritional management within the community.

1.1.5.2 Nutrition and falls – opportunities for identification and first-line management

Loss of muscle mass and strength and malnutrition are among the important modifiable risk factors contributing to falls and functional decline (Kim et al., 2010; Moreland et al., 2004). Healthcare professionals in frequent contact with nutritionally vulnerable older adults include multidisciplinary teams working to decrease risk of falls and fall related injuries, but nutrition appears to have a limited role within these services. Falls clinics present an opportunity to identify individuals at nutritional risk who might benefit from nutritional intervention while they are in contact with the falls service.

National guidelines for the prevention of falls and interventions for the management of falls aim to target the modifiable risk factors associated with falling through single, multifactorial or multicomponent interventions (Hopewell et al., 2019; NICE, 2013). While national clinical guidelines recommend multifactorial or multicomponent

management of falls, including nutrition, there is a failure in specifically reporting nutritional interventions (NICE, 2013). A recent Cochrane systematic review (Hopewell et al., 2019) concluded that low quality evidence from 19 RCTs of multifactorial interventions (n=5853 participants, median age 77 years, n=4 studies included a nutritional intervention) and moderate-quality evidence from six RCTs (n=1085 participants, n=2 studies included a nutritional intervention) may reduce the rate of falls compared with usual care or control (rate ratio 0.77, 95% CI 0.67 to 0.87 and rate ratio 0.74, 95% CI 0.60 to 0.91, respectively). However, the heterogeneous nature of the studies included (e.g. variations in intervention duration, populations included at nutritional risk, settings and outcomes reported) contribute to the low quality of the evidence and therefore caution is required in the interpretation of the findings. There is limited evidence on the role of nutrition within UK falls clinics. Evidence from a survey of 15 falls clinic in Australia in 2001, demonstrated no nutrition interventions were reported by any clinics, however one clinic reported conducting nutritional screening (Australian Nutrition Screening Index tool), one assessing BMI, and two reported an 'other' nutrition assessment procedure (not described) (Hill & Schwarz, 2001). While falls clinics may present an opportunity, the gap in evidence on the nutritional practices within falls clinics in the UK make it difficult to understand how nutrition may be integrated within the multi-disciplinary management of falls and requires further research.

1.1.5.3 Making every contact count

The NHS public health initiative "making every contact count" considers the importance of the opportunities HCPs have for the improvement of health and lifestyle behaviours such as decreased smoking and weight management of the individuals

they encounter within practice (Public Health England, 2016). This approach highlights the requirements for the provision of professional training resources and support needed to equip HCPs and increase competence and confidence for the delivery of behaviour change interventions to individuals. An intervention study provided and evaluated training for health and social care practitioners on the communication skills ("Healthy Conversation Skills") needed to facilitate their clients to improve diet and lifestyle behaviours (Lawrence et al., 2016). The trained HCPs had greater use of communication skills within their practice after one year of training, compared to the non-trained group (Lawrence et al., 2016). However, this study did not evaluate the impact of the delivery of this intervention on outcomes for the patient population. Thus, studies are needed to evaluate this approach on patient outcomes. Similar use of this approach has been implemented in the training of medical students aimed at decreasing non-communicable diseases through promotion of physical activity within their contacts (Gates, 2015). However, while resources are available for the inclusion of training into curriculums, again there is no evidence on the efficacy of this training on patient outcomes (Gates, 2015). Studies are urgently needed to evaluate the impact of these "make every contact count" interventions on the target population groups.

The "make every contact count" initiative has focused on behavioural changes promoted by HCPs to achieve lifestyle change and improved wellbeing (e.g. healthy eating and decreased smoking). There is potential for implementation of this approach in the identification and first-line management of malnourished patients in the community however, there is a lack of evidence regarding the efficacy of this approach on patient outcomes. Similarly, the efficacy of non-dietetic HCP involvement in the identification and first-line management of malnutrition warrants further research.

1.1.6 Challenges of nutritional identification and management

Arguably, given the multifaceted healthcare needs of older adults, and the complex support systems often required, management is the responsibility of all HCPs encountered by older adult patients. Involving non-dietetic HCPs in the detection and first-line management of malnutrition among older adults could be considered. Whilst the aim of nutrition screening is to use simple and quick tools appropriate for trained staff (e.g. MUST tool) from different disciplines, its implementation in clinical practice has been challenging. The reported challenges in implementing nutrition screening procedures include staff time constraints, lack of training and knowledge in the use of nutrition screening tools and identification of nutritional risk, as well as resource implications. Any or all of which may lead to the failure to identify nutritionally at-risk individuals (Cowan et al., 2004; NICE, 2006). Focus groups with nurses working on hospital wards drew attention to prioritizing other nursing duties and lack of appropriate skill in performing nutritional screening as barriers to applying nutrition screening on hospital admission (Porter et al., 2009; Raja et al., 2008). Additionally, a lack of understanding around malnutrition and its consequences has led to decreased detection and hence treatment from healthcare professionals (Cowan et al., 2004; NICE, 2006). These findings are not surprising, as these studies assume that non-dietetic HCPs have the capacity, knowledge and training to incorporate nutritional screening into their professional roles. Furthermore, there is a gap in the literature on the efficacy of nutritional management which can provided by non-dietetic HCPs. Nutritional screening is the first point of identification of nutritional risk, where once identified additional comprehensive investigations are needed to identify the underlying nutritional problems, followed by appropriate management. Additionally, among older adults, there may be several risk factors of

malnutrition that require screening and complex management of multi-morbidities (Tappenden et al., 2013). Thus, it is important to understand the skills needed for non-dietetic HCP involvement in nutritional management and the indications for referral to a dietitian. More research is required to understand the capabilities of non-dietetic HCPs in all aspects of screening, first-line management and onward referral, discussed further below.

Ensuring sufficient training and support is provided for implementation at the appropriate time and setting, is necessary to overcoming the challenges of poor recognition. Several reviews have identified a mixed effect of nutrition training in supporting staff in to improve nutritional care through positive effects on patient outcomes (Low et al., 2015; Marples et al., 2017; Marshall et al., 2013; Mogre et al., 2016). In these reviews, the included studies provided interventions with different modes and duration of delivery and evaluated different outcomes of interest across a variety of settings. Marples et al. (2017), reported improved staff knowledge after training, however not all studies reported on this outcome. Knowledge is a short-term outcome which may be measured in studies looking at staff training, however it must be considered whether knowledge is sustainable in the long-term and translates into action in clinical practice. Training and increasing knowledge may need to be applied in parallel to clinical practices (de van der Schueren et al., 2014). Within the community, an educational programme for MUST screening amongst primary care practices, nursing homes and health centres highlighted an increase in nutritional knowledge among staff, six months after the intervention (Kennelly et al., 2010). This training intervention was provided by a dietitian which included resources, case studies and nutritional advice booklets (Kennelly et al., 2010). A short nutritional education session (<1 hour) delivered to nurses and general practitioners in the

community focusing on enteral feeding, highlighted improvements in knowledge directly after the intervention but was not sustained after 6 months (Madigan et al., 2014). It is also important to consider the delivery method for training. The most recent review of training strategies by Marples et al. (2017) highlighted key factors to consider amongst the studies when categorizing training strategies. Studies were categorized according to cognitive (didactic teaching), behavioural (practical implementation of skills), and psychological (individualized or group feedback and reflection) training strategies. Strategies varied in duration and mode of delivery, while some studies did not fully report the intervention details (Marples et al. 2017). Passive strategies such as didactic teaching and lectures were found to be the least effective (Bloom, 2005; Marples et al., 2017). Furthermore, it is important to consider the care setting and HCP turnover, where high turnover of staff may require repeated training sessions (Abe et al., 2013). Further research is needed to evaluate the type of training, the efficacy of the nutrition intervention strategies implemented by non-dietetic HCPs after training in clinical practice, and the factors which may act as barriers of change upon implementation.

1.1.6.1 Perceptions of healthcare professionals

While evidence suggests a potential role for non-dietetic HCPs in the detection of malnutrition and the provision of first-line management, it is important to consider HCP's perceptions on how nutrition may be integrated into their usual role, the skills needed and the acceptability of inclusion of nutritional care within their own professional activities. Understanding the perceptions of HCPs towards nutritional screening and first-line management, is a preliminary step towards potentially improving the detection and management of malnutrition. Limited evidence has

highlighted that non-dietetic HCP's skills, knowledge and time for the inclusion of nutritional care within their practice may be a barrier to successful engagement with nutritional interventions. A multidisciplinary evaluation amongst staff working with hospitalized older adults (n=22 participants, 3 focus groups), aimed to understand barriers to oral feeding and other nutritional interventions (Ross et al., 2011). Amongst the barriers identified in this study was a lack of professional responsibility surrounding their roles and other professional roles surrounding nutritional care (Ross et al., 2011). However, while strategies were suggested by staff during the focus groups such as nominating someone responsible for meal assistance and education on dietetic practices and referral pathways, these strategies were not implemented. This highlights the need for future mixed method studies that inform implementation of nutritional strategies in clinical practice. Furthermore, this study did not capture patient's perspectives of nutritional and support needs.

Limited evidence is available around the perceptions and knowledge of physicians and other HCPs in providing nutritional care nutritionally vulnerable older adults in a non-acute setting, such as community falls prevention services. Most recently, two qualitative studies evaluated the management of malnutrition by GPs (n=16) (Castro, Reynolds, Kennelly, Clyne, et al., 2020) and HCPs working in community and primary care (n=75) (Browne et al., 2021) in Ireland. A lack of knowledge on the responsibility for the management of malnutrition in the community setting was highlighted by GPs (Castro et al., 2020). One of the themes HCPs highlighted was a lack of clear diagnostic pathways and scope for the management of malnutrition within the community (Browne et al., 2021). Similarly, assessment of the knowledge of nursing staff in nursing homes, found low nutrition knowledge around care of older malnourished people (Bauer & Kirchner, 2020). The empowerment of HCPs to

include nutrition care within patient protocols in a particular setting can aid in providing appropriate and timely nutrition through the opportunities provided by multiple healthcare contacts. This would have the potential to improve the health of the vulnerable older adult population during these contacts (Public Health England, 2016). While nutritional care pathways for specific diseases have been developed in recent years such as for cancer management (Dewar & Porter, 2018), few include the role of non-dietetic HCPs. Additionally, there is limited evidence on the efficacy of nutritional care pathways in practice. One nutritional care pathway developed for interdisciplinary acute care (INPAC) in Canada resulted in improved screening and comprehensive assessment by staff after a 24-month implementation period (Keller et al., 2015; Keller et al., 2019). The pathway depicted care processes aimed to guide best practices for healthcare providers and included both nutritional screening and triage (comprehensive assessment) to avoid missing malnourished patients (Keller et al., 2015). Implementation of this pathway required coordination with several hospital departments as well as additional funding (Keller et al., 2017). Thus, this results in barriers which require adequate staffing and organisational support for effective management.

Patient-centred care may be beneficial to patient outcomes (Dwamena et al., 2012). Active involvement of patients in their nutritional care resulted in improved nutritional intake in a sample of hospitalized older adults across two studies (Pedersen et al., 2012). In both these studies training in nutritional care management for nurses involved the patients actively involved alongside (Pedersen et al., 2012; Holst et al., 2011). This can help improve patient outcomes, such as increasing energy intake by understanding food choices and nutritional problems from patients themselves (Marshall et al., 2020). Therefore, while it is important to understand the strategies

required for improving the identification and first-line nutritional management by HCPs, it is also important to understand the perceptions of nutritional care of the patient who may be at nutritional risk and in receipt of a nutritional service throughout their healthcare journey (e.g. service user).

1.2 Context and Rationale

The detection and management of malnutrition in older people is complex, potentially involving many HCPs. As such, malnutrition is often not identified and nutritional care is frequently sub-optimal. Evidence from the literature suggests that the bulk of malnutrition originates in the community, resulting in a vicious cycle of increased hospital admissions, poor recognition and management of malnutrition in hospital, discharge of individuals back into the community with worsened malnutrition and often inadequate supports for optimal management. If malnutrition is under recognized and untreated it is costly to both the health of individuals and overall health and social care systems. Evidence suggests that there are significant challenges in the identification and management of malnutrition across healthcare settings, in part due to relatively limited access to dietitians and the lack of clarity around the roles of non-dietetic HCPs. Improved opportunities for recognition of nutritionally vulnerable individuals, and the implementation of management pathways are needed.

Additionally, the scope of nutritional interventions in older adults in the community remains limited. Furthermore, the low dietetic workforce numbers in the UK and globally is evidently too low to tackle the malnutrition burden alone, thus innovative ways for dealing with malnutrition are required. Other healthcare professions in regular contact with nutritionally vulnerable older adults in the community may have a role in the detection and/or management of malnutrition, however there is limited

evidence on the types of interventions that may be provided by non-dietitians and the efficacy of providing these interventions. Furthermore, before designing nutritional strategies for integrating nutrition within the roles of non-dietitians, it is necessary to understand the professional boundaries of the different HCP roles and whether nutritional practices can fit within these roles. Thus, there is a gap in understanding the perceptions and experiences of those providing nutritional care to nutritionally vulnerable older adults in the community. In parallel, there it is imperative to understand the needs of the patients as service users for targeting nutritional interventions. Therefore, this PhD thesis aims to answer the research questions below:

1.3 Research Questions

1. What are the major components of nutritional care provided to nutritionally vulnerable older people in the community?
2. Can non-dietetic healthcare professionals provide effective nutritional care to improve outcomes in older people?
3. How can strategies be designed to improve nutritional care for nutritionally vulnerable older people in the community?

Chapter 2: Methodology

2.1 Research Aims

The aims of this thesis were to:

1. explore the nutritional care currently provided to nutritionally vulnerable older people in the community
2. establish whether non-dietetic healthcare professionals (HCPs) can provide effective nutritional care to nutritionally vulnerable older people and
3. to suggest potential strategies to improve the nutritional care of people accessing falls services.

This chapter will describe the overall research framework, stages of the PhD, and research paradigms and theoretical contributions used to address the research aims of this PhD thesis:

2.2 Research Framework

This research project will utilise the MRC (Medical Research Council) framework for the design of complex interventions (Craig et al., 2008; Medical Research Council, 2006). The MRC framework has been used in healthcare services to guide the formulation of an intervention (Craig et al., 2008). Examples of this design among the older adult population include the development of a clinical decision system in dementia patients (Dowding et al., 2017) and modelling a re-design intervention for decreasing falls in the elderly (Eldridge et al., 2005). In older people, the multifactorial causes of malnutrition, and patients' contacts with a variety of healthcare professionals and services across care settings, contributes to the complexity of designing potentially effective nutritional care interventions. In this project, in order to capture the multifaceted components of the nutritional care of older

people and to develop strategies for nutritional care interventions, the four studies will be incorporated into the development phase of the framework (Creswell et al., 2011; Medical Research Council, 2006). The MRC framework is described in **Figure 2.1** below.

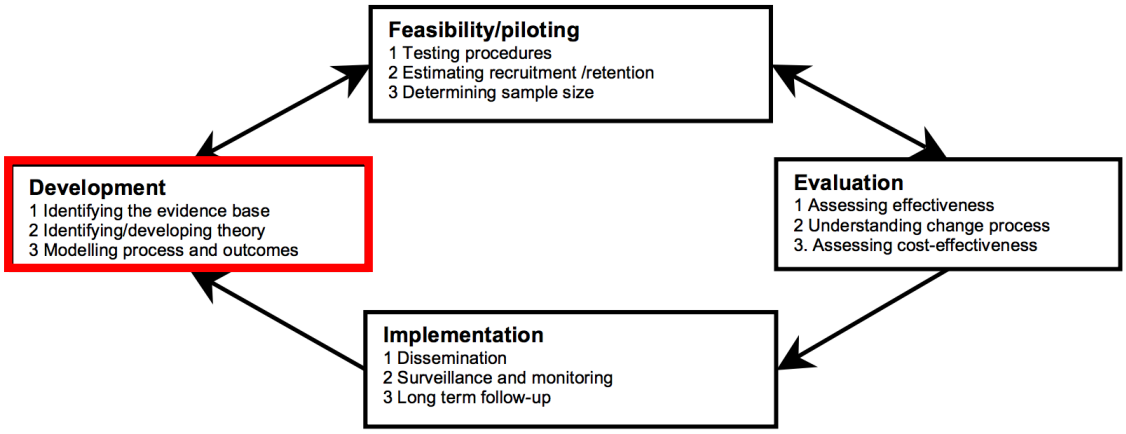


Figure 2.1: Key stages and elements of the development & evaluation process of a complex intervention Adapted from: (Medical Research Council, 2006)

The "development" phase of the above framework is the focus of this project and will provide the groundwork for informing the design of future nutritional care intervention through the identification of the evidence base (stage 1 of PhD thesis), identifying and developing theory and modelling process (stage 2 of PhD thesis). The approaches summarised in **Figure 2.2** will be used to address the research aims and guide the development of an intervention.

Details of the aims, methods, results and discussions for each stage represented as a study will be described in the subsequent chapters.

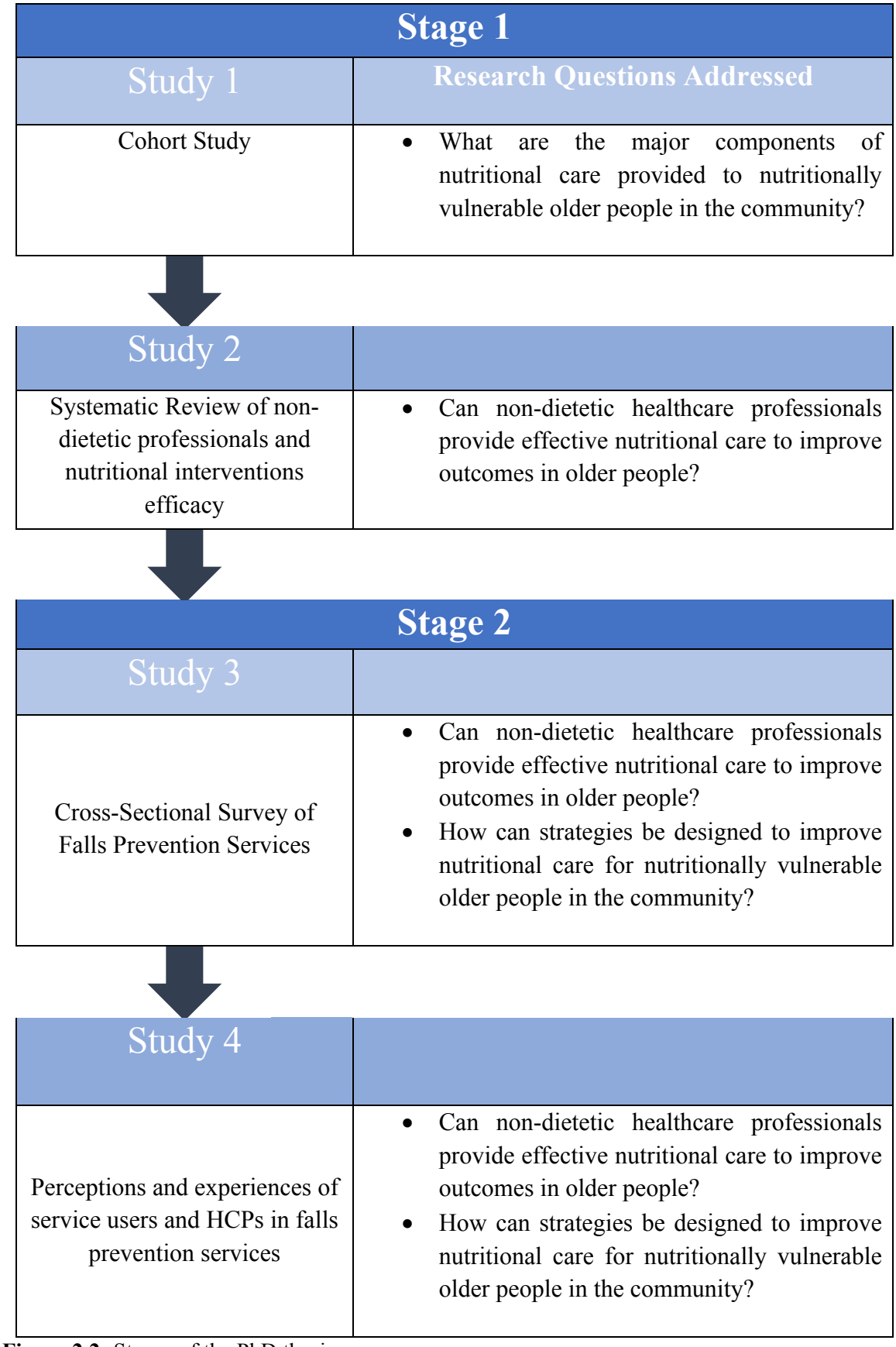


Figure 2.2: Stages of the PhD thesis

2.3 Stages of PhD Thesis

Stage 1:

Study 1: Associations between nutritional risk, healthcare contacts and documented nutritional care among older adults in the community: A cohort study

First, electronic health record (EHR) data from a subset of participants from an existing observational cohort study, NUTRICOM (*The Impact of Nutrition Risk Status on Older People in the Community*) were analysed to explore and describe the associations between nutritional risk status and the number of contacts in hospital and community settings, HCPs and the documented nutritional care currently provided to nutritionally vulnerable older people in the community (chapter 3).

In order to address the gaps within the evidence (chapter 1) and understand the nutritional practices currently in place and the components of the nutritional care being provided to the older population, an observational cohort study design was carried out (Mann, 2003). The strength of the cohort study design will provide a description of the characteristics of a representative older population utilising health and community services and investigate associations between nutritional risk groups and their contacts and nutritional documentation over a one year period, described in further detail in chapter 3. Additionally, this study helps identify the gaps and opportunities in nutritional care across healthcare and community settings, which will be built upon in the following studies towards the development of nutritional interventions.

Study 2: The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: a systematic review

Secondly, a systematic review was conducted to identify and evaluate the current clinical trial evidence on the effectiveness and characteristics of nutritional care interventions provided by non-dietetic HCPs on patient outcomes in adults at risk of malnutrition. In addition, evaluation of the reporting of these interventions was undertaken using the TIDieR framework (chapter 4).

A key limitation among intervention studies is a lack of description of the interventions, therefore using a standardised template or checklist provides guidance for the evaluation of studies to assess their completeness and enable replication (Hoffmann et al., 2016).

Stage 2:

Study 3: Nutritional Care Practices in Falls Prevention Services in England

Building upon the gaps and opportunities from stage 1 a cross-sectional survey was conducted to identify current nutritional care practices within multi-disciplinary falls prevention services in England (chapter 5) and provide evidence on which nutritional care practices are currently provided within falls services and by whom.

Study 4: Perceptions and experiences of nutritional care among HCPs and Service Users within Falls Prevention Services

Fourth, using data generated during stages 1 to 3, a qualitative study was conducted using semi-structured interviews to capture older adult service users and HCP experiences and perceptions of nutrition services, to explore current service provision and to suggest potential nutritional care interventions for integration within multidisciplinary falls prevention services (chapter 6).

For this PhD thesis, the original framework of Chapter 6, aimed to utilise the six-step Experience based Co-design method (Adapted from EBCD toolkit: The Point of Care Foundation). The EBCD method aims to improve healthcare service through capturing and understanding the experiences of patients and health care workers in a defined part of a service, collaborate in the re-design of patient centred services and the feedback and co-design improvement strategies. The full EBCD process did not take place and the process was adapted due to Covid-19 circumstances (see: COVID impact statement). The perceptions and experiences of service users and non-dietetic HCPs are reported in chapter 6 as a qualitative research study.

The exploratory nature of qualitative research is a strength that will aim to explore and generate new knowledge around perceptions and experiences of populations providing and accessing healthcare services (Williams et al., 2019). Qualitative methods will allow for an in depth exploration of the barriers and facilitators that should be considered before designing nutritional interventions in order to help facilitate their performance, as well as suggest nutritional strategies within practice from those at the frontline of care (Teddlie & Tashakkori, 2003). Given the complexity of the healthcare system and the populations involved, qualitative research is beneficial in addressing complex multi-component interventions (Busetto et al., 2020). This study used semi-structured interviews which will be described in detail in chapter 6.

The thesis concludes by identifying opportunities for developing cross-boundary nutritional care pathway(s) and/or interventions for the identification and first-line management of malnutrition. Intervention strategies suggested for the integration of nutritional interventions in falls prevention services will require future exploration for

their capacity to influence earlier identification and management of older adults by frontline non-dietetic HCPs.

2.4 Research Paradigms and Theoretical Contribution

I approach this PhD with a background as a clinical dietitian where my clinical practice and knowledge in dietetics may influence the design and interpretations of the different stages within this thesis. For example, the lens of the nutritional care pathway in clinical practice is used when designing and interpreting chapter 4 (cohort study) and chapter 5 (falls survey). In chapter 6, this may influence how participants may have seen and interacted with me as a specialist to discuss their "eating habits" (service users) or perform nutritional activities (HCPs). Thus, it was important to attempt to remain neutral during interviews. My background may have also guided interpretation of findings to focus on the clinical rather than the social aspects of nutritional care which may also be representative among the community dwelling older adults. This undoubtedly leads to my self-awareness when interpreting findings which focus on "nutritional practices" such as timely nutritional identification, referral procedures, skill needed for practices. Thus, during interviews with non-dietetic HCPs, a step back was needed to challenge my reflexivity and to objectively explore the processes within the falls services.

This thesis brings forward four main interlinking elements to the research field. (1) A cohort study, bridging the cross-boundary gaps of the acute and community settings and the across the different professions. (2) The evaluation of completeness ad reporting of the interventions from the systematic review is a new method which uses a standardized approach (TIDieR). (3) The gaps from the cohort study and systematic review will add to the evidence base for the promotion of "making every contact

count" on the potential interventions which may be provided by the non-dietetic HCPs. (4). Lastly, the qualitative study will contribute to the understanding of the gaps in nutritional care among MDTs, service users and carers. Interventions for the integration of nutritional care within multidisciplinary services will be generated and provide groundwork for future feasibility studies.

Chapter 3: Associations between nutritional risk, healthcare contacts and documented nutritional care among older adults in the community: A cohort study

3.1 Introduction

Evidence in chapter 1 showed that people with malnutrition are at increased risk of hospital admission, GP visits, and medication for healthcare problems (Guest et al., 2011; Stratton et al., 2006). The multifactorial causes of malnutrition result in contact with different healthcare professionals in a variety of locations, providing potential opportunities for identification and first-line management of nutritional risk. Malnutrition is not disease-specific and can arise at any time during a patient's healthcare journey and yet evidence suggests that it is frequently under-recognised and under-treated both in hospital and the community (Elia et al., 2005). To date, emphasis has been on identifying malnutrition during acute hospital admission, with limited prominence within the community (Hamirudin et al., 2016). Furthermore, evidence shows that the prevalence of malnutrition varies in different healthcare settings (figure 1.1), thus it is likely that the amount of detection and management of malnutrition may also vary according to setting.

Early identification and first-line management of malnutrition during contact with healthcare services has the potential to prevent or ameliorate malnutrition in older adults (Murphy et al., 2018). However, there is limited evidence on where to target screening and first-line management interventions and who should be involved. Nutritional screening is the first step in the process to identify people at nutritional risk who might benefit from nutritional intervention. In people with malnutrition

living in the community, there remains a gap in understanding on (1) where healthcare contacts occur, (2) with whom, (3) the proportion of at-risk patients correctly identified and (4) in what settings and departments people are being identified and the first-line actions occurring. Previous studies addressing nutritional screening have relied on cross-sectional designs providing information on associations between variables at one point in time in a setting, rather than following up nutritional practices in a group of nutritionally at-risk individuals over longer time periods. There is currently limited dietetic staffing capacity to detect and manage the high burden of malnutrition alone (NHS Digital, 2018a). There is scope for other HCPs to assist with nutritional care (Marshall et al., 2013; Rist et al., 2012, Liu et al., 2014; Saka et al., 2010; Slinde et al., 2002), however, to our knowledge few studies have explored the amount of first-line management activities such as nutritional assessment and provision of dietary advice by non-dietetic HCPs.

To develop interventions that target malnourished older adults in the community there is a need to explore the number, setting and nature of contacts older adults have in different healthcare settings (community, inpatients, outpatients), with different clinical departments and healthcare professionals (e.g. consultants, nurses and AHPs), as well as understanding the current nutritional practices of non-dietetic HCPs during these contacts. This information will help identify the gaps and opportunities needed for effectively making every contact count, identifying the support needed and targeting resources for the prevention of malnutrition.

Using data collected from electronic healthcare records (EHR) from a cohort of older adults (aged >60 years) based in the community, this study aimed to:

1. Quantify the number of contacts in hospital and community settings with healthcare professionals and the proportion of participants with documented nutritional care over a 12-month period

2. Explore associations between nutritional risk status and the number of healthcare contacts and documented nutritional care over a 12-month period.

3. Identify opportunities for developing cross-boundary nutritional care pathway(s) and/or interventions.

3.2 Methods

The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were used to guide the reporting of this study (Vandenbroucke et al., 2007).

3.2.1 Study Design

An observational cohort study (NUTRICOM) begun in 2015 aimed at evaluating the impact of nutrition risk status on older people in the community in South London, their use of health and social care resources and how malnutrition impacted quality of life and other patient centred outcomes. NUTRICOM participants were assessed at baseline and then followed up at 3, 6 and 12 months. Participants (n=570) were recruited from four different settings: General Practice (GP) (n=180), receiving healthcare at home from community services (n=52), Intermediate Care (IC) i.e. receiving healthcare in their residence or a community-based bedded unit (n=170), and at discharge from the acute setting (n=170).

In the study for this PhD thesis, a subgroup of the NUTRICOM cohort (n=200) were selected if they had specifically consented to their healthcare records being reviewed

and accessed. This study had already gained NHS ethical approval (REC: 15/YH/0094).

3.2.2 Setting

Electronic health records (EHR) at Guy's and St Thomas' Hospital (GSTT) were reviewed for the first 100 participants with available NHS numbers from each of the two healthcare settings (1) IC and (2) GP. Data were accessed from EHR for a one year period starting from patient entry to the NUTRICOM study. The health record system at GSTT is known as the Electronic Patient Record (EPR). Access to this system allows identification of patient records at GSTT, Kings College Hospital (KCL), and South London and Maudsley Hospital (SLaM) as well as information from some primary care settings. Patient information was collected from records on the EPR system, documents uploaded to the system by healthcare professionals, and the "e-noting" complementary system. Electronic community health records were also reviewed for the two samples. The community record system is known as Care Notes and access allows identification of healthcare and social services provided to patients within the community (after hospital discharge). Data were not collected from GP (primary care) records.

3.2.3 Participants

Two hundred participants with available NHS numbers were recruited from two healthcare settings (IC and GP) of the NUTRICOM cohort (100 participants from each). The main inclusion criteria were adults aged greater than or equal to 60 years, having a National Health Service (NHS) number, capable of giving informed consent or assent (if not capable to provide consent), capable of being weighed and having a

height measurement, and not receiving end of life care (> 3 months life expectancy). Demographic and baseline clinical data collected during the NUTRICOM study were used to provide the baseline characteristics of the population in the current study.

3.2.4 Data Collection

For each participant the following data were collected from the EHR systems; the number of contacts with hospital and community settings, location of each contact, departments where participants were seen, contacts with healthcare staff, staff professions, contact reasons and documented nutritional care. Data collection, coding procedures and variable definitions are described in detail in the standardized protocol (**Appendix 2).** In the first stage, data were collected by myself using the protocol in table 1, followed by a second stage of data coding for analysis based on definitions from table 2. A standardised operating procedure (SOP) incorporating a template was used to collect data using Microsoft Excel version 15.34 (Microsoft Corporation, Redmond, Washington) (**Appendix 3**). For ethical reasons, the template was password protected and accessed only by myself, to protect the privacy of patient identifiable information. The template, protocol and coding process was agreed by the lead researcher (MD) and two supervisors (CEW and CB) and aimed to address reliability of the data collection. This SOP was piloted on the first ten participants from the GP cohort. The main issues addressed were coordinating variables based on the EHR interface. To further improve the reliability, the EHRs of both cohorts (n=200) were reviewed a second time after consultation with supervisors on variable definitions to minimize missing information.

3.2.4.1 Variables

a. Participant characteristics and confounders

Participant characteristics were collected at baseline as part of the NUTRICOM study by patient interview. Baseline data collected were:

- Age, gender, and location of recruitment
- Frailty score, calculated to characterise the study cohort according to a 7-point frailty scale using the Clinical Frailty Scale (Rockwood et al., 2005). The clinical frailty scale explores the physical, psychological and social domains of frailty and provides a score ranging from 1 (very fit) to 7 (terminally ill).
- Comorbidity score, calculated to characterise the study population according to the number of self-reported comorbidities using the Charlson Co-morbidity Index (Charlson et al., 1987). The index contains a list of 16 conditions, scored as applying 1 point for each condition reported or diagnosed. The age-adjusted comorbidity score was than calculated by applying one additional point for each decade range beginning at 2 points for 61-70 years.
- Weight, height, and nutritional screening questions were used to calculate BMI and characterise the cohort according to nutritional risk status (described below). Weight, height and nutritional screening score were measured at baseline. Nutritional screening questions were combined from the MUST (BAPEN, 2003) and NRS-2002 (Kondrup et al., 2003). Questions asked to characterise the population as high nutritional risk or low nutritional risk included: weight loss in the past 3-6 months (yes/no) and BMI calculated as underweight (BMI<20 kg/m^2).
- Deprivation Score based on the postcode: The deprivation score was calculated as the index of multiple deprivation (IMD), ranked based on where the postcodes rank in England, with 1 being the most deprived area and 32844 ranked as the least deprived (GOV.UK, 2019). This was converted to groups

of 10 or IMD decile (Ranging from the 10% most deprived areas to the 10% least deprived areas).

- Definition of healthcare setting as either recruited from IC (receiving healthcare services in community) or recruited GP.

b. Exposures or Predictors

Definition of Nutritional Risk: Participants were identified as "at nutritional risk" if they had a BMI $\leq$20kg/m^2 (underweight) or weight loss in the previous 3-6months reported at baseline. Majority of participants did not know their weight history at baseline, thus the MUST or NRS scores were not used to categorise nutritional risk status.

c. Outcomes

1. Healthcare Contacts:

Data on healthcare contacts were collected from the EHR for one year from the start of the study period and included:

- Location of patient contact (e.g. hospital, inpatient, outpatient, department, community)
- Reason for contact
- Admission details
- Healthcare professionals seen

The outcomes of interest included the total number of hospital contacts, total number of HCPs seen, total number of contacts with community services and total number of community HCPs. Definitions of the outcomes and the data collected are found in (appendix 2**).**

2. Documented nutritional and health status:

Data on documented nutritional care were collected from the EHR for one year from the start of the study period and included:

- Weight, height, BMI, MUST score, % weight loss, appetite, changes in dietary intake (e.g. nutritional assessment)
- Performance of nutritional screening & outcome of screening (e.g. appropriate action taken e.g. referred to dietitian if MUST score ≥2)
- The healthcare professional and department where screening and assessment took place

Rationale: Based on NICE guidelines (2006) recommending nutritional screening to be performed by trained HCPs at inpatient admission and first clinic outpatient appointment and documented in patient records. Onward referral for nutrition support should be considered in patients at risk of malnutrition (MUST score≥2) (appendix 2).

- Documented nutritional interventions:
  - Whether a dietitian referral was made based on nutritional screening outcome or HCP referral
  - Types of nutrition interventions provided (e.g. oral nutritional supplements, red trays, dietary advice, food fortification)
  - The healthcare professional and department providing any intervention
  - Description of nutritional intervention or advice provided (including any written material)
  - Documented monitoring, follow-up arrangements and reviews

Rationale: Based on guidelines from the nutrition care process from the British Dietetic Association (appendix 2).

The outcomes of interest included: the total number of participants with documented nutrition screening, the total number of participants receiving nutritional measurements (defined as: BMI, weight, MUST score), total number with dietetic referral, total number with first-line management (defined as: nutritional assessment, advice and monitoring documented), the total number of HCP contacts providing nutritional care (assessment, intervention, monitoring), total number of participants seen by a dietitian, methods used for identification and management. Detailed definitions of the data collected are found in appendix 2.

3.4.2.3 Sample Size

This study was undertaken in the early stages of the PhD project where the NUTRICOM study was not complete, thus data were not available on the full cohort (N=570). A convenience sample of 200 participants (100 IC and 100 GP participants) was considered appropriate as this was an exploratory study aimed at understanding the healthcare interactions of this population. One hundred participants with available NHS numbers were reviewed in ascending order from each setting (IC and GP). However, it must be noted, the use of a convenience sample may be a source of bias within this study when interpreting results (Doohoo et al., 2009).

3.2.4 Statistical methods

The characteristics of the study population were described using data generated from the baseline assessment of the NUTRICOM study. This included: age, BMI, weight loss in previous 3-6 months, frailty and comorbidity scores, and care received.

Poisson regression is a generalised linear model used to predict a dependent variable or outcome that consists of "count data" from one or more independent variables or predictor (Coxe et al., 2009; Hayat & Higgins, 2014). Poisson regression was used to model the number of contacts an older adult participant had with hospital and community services over a one-year period based on nutritional risk status (rate ratio). Logistic regression was used to model the association of nutritional risk (odds ratio) on the proportion of people with at least one nutritional documentation. To independently examine the associations between nutritional risk status and healthcare contacts and documented nutritional care, the model was created and adjusted for factors that might impact nutritional risk status: age, total comorbidity score, frailty score, setting (IC vs GP). Confounders were adjusted after checking baseline significance.

For a detailed exploration, descriptive analysis of the healthcare contacts and the proportion of participants with nutritional documentation are also reported for each nutritional risk group. All statistical analysis was performed using IBM SPSS v26 (IBM Corporation, Armonk, New York).

3.2.4.1 Missing data

To decrease the risk of non-response bias (Bruce et al., 2018), participants with missing baseline data were excluded from analysis (n=4). For participants who withdrew from the study (n=1) outcome data were included for the 12-month study period (based on consent). For participants who died during the study period, outcome data were included until the point of mortality (n=28).

3.3 Results

3.3.1 Baseline Characteristics

A total of 200 participants were included for evaluation and **Table 3.1** describes the baseline characteristics of the cohort. Four (2%) participants had incomplete baseline data to categorise nutritional risk status and were excluded from analysis. At baseline 82 (42%) participants were categorised as high nutritional risk and 114 (58%) participants were categorised as low nutritional risk. Mean age was significantly higher in the high risk group compared with the low risk group. The majority (82%) of participants in the high risk group were recruited from the IC setting, while the majority (74%) of the participants in the low risk group were recruited from GP. A significantly greater proportion of participants in the high risk group had at least one comorbidity and the median frailty score was significantly higher in this group (table 3.1). There were no significant associations with gender at baseline between the two groups or IMD deciles.

Table 3.1: Baseline Characteristics of Participants (n=200)

	Total (n=200)	**High Nutritional Risk (N=82)**	**Low Nutritional Risk (N=114)**	**p-value**
N(%)				
Gender				
Male	86 (43)	37 (45)	48(42)	p=0.674
Female	114 (57)	45(54)	66(58)	
Recruitment setting				
IC	100 (50)	67(82)	30 (26)	p<0.001
cohort	100 (50)	15(18)	84 (74)	
GP cohort				
At least 1 comorbidity[a]	129(65)	74(90)	51(45)	p<0.001
Frailty score≥4[b]	108(54)	66(80)	33(29)	p<0.001
Weight loss (previous 3-6 months)	74(37)	43 (52)	32 (28)	p<0.001
IMD deciles <5[c]	140 (70)	61(74)	79 (69)	p=0.299
Mean (SD)				
Age (years)	77.79 (9.1)	81.5 (8.85)	74.93 (8.45)	p<0.001
Mean BMI (kg/m^2)	26.15(6.16)	23.86(5.4)	27.66 (6.17)	p<0.001

BMI: body mass index; GP: general practice; IC: intermediate care; IMD: index of multiple deprivation; SD: standard deviation
[a]measured by the Charlson co-morbidity index (Charlson et al., 1987)
[b]measured by the CSHA Clinical Frailty Scale (Rockwood et al., 2005)
[c] measured by Index of Multiple Deprivation 2019 (Gov.uk, 2019)

3.3.2 Healthcare contacts

Table 3.2 summarises the results of the Poisson regression analysis used to model the association between nutritional risk status and the number of contacts with healthcare settings and healthcare professionals for older adults. During the one year study period, the group at high nutritional risk had a 69% greater risk of contact with hospital services than the group at low nutritional risk (adjusted RR: 1.689, 95% CI 1.488-1.917). Similarly, the group at high nutritional risk group had a 95% increased risk of

contact with non-dietetic HCPs in hospital than the low risk group (adjusted RR: 1.945, 95% CI 1.680-2.251). The model was adjusted for: age, total comorbidity score, frailty score and recruitment setting (full model in **Appendix 4**).

Associations between nutritional risk category and community healthcare contacts were also examined (table 3.2). Participants in the high nutritional risk group had 43% more contacts with non-dietetic HCPs in the community than the low risk group (adjusted RR: 1.429, 95% CI 1.046-1.952). However, the increased contacts among the high nutritional risk group with community services was not significantly associated (table 3.2). Descriptions of the number of healthcare contacts for the total cohort and for the two nutritional risk categories are described below for hospital and community settings (**Table 3.3 and Table 3.4**).

Table 3.2: Associations between nutritional risk category and total number of healthcare contacts with hospital, community and healthcare professionals (n=196)

	Nutritional Risk Status[a]					
	Unadjusted			**Adjusted[b]**		
	RR	**95%CI**	**p-value**	**RR**	**95%CI**	**p-value**
Total number of hospital contacts	2.045	(1.844-2.268)	p<0.001	1.689	(1.488-1.917)	p<0.001
Total number of HCP contacts (hospital)	4.476	(3.912-5.121)	p<0.001	1.945	(1.680-2.251)	p<0.001
Total number of community service contacts	1.578	(1.205-2.065)	p=0.001	1.314	(0.976-1.769)	p=.072
Total number of HCP contacts (community)	1.79	(1.346-2.381)	p<0.001	1.429	(1.046-1.952)	p=0.025

CI: confidence interval, HCP: healthcare professional; RR: risk ratio
[a]Independent variable (high nutritional risk vs. low nutritional risk)
[b]Adjusted for: age, total comorbidity score, frailty score, and recruitment setting

3.3.2.1 Hospital

Data on hospital contacts for the full cohort (n=196) and categorised by nutritional risk are provided in table 3.3. Twenty-six (13%) participants did not have any documented hospital contacts during the one year study period. Participants categorised as high nutritional risk had a greater number of total contacts with hospital than the low nutritional risk group, suggesting the high utilisation of healthcare services among those at nutritional risk (n=884). 58% of the total contacts were in participants at high nutritional risk. Most of the hospital contacts were to super acute and acute hospitals and outpatients in both nutritional risk categories (table 3.2).

Table 3.3: Hospital contacts according to nutritional risk category (n=196)

	Total (n=196)		**High Nutritional Risk (n=82)**		**Low Nutritional Risk (n=114)**	
	Total count (n)	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**
Patients with at least one hospital contact n (%)	170 (87)		79 (96)		88 (77)	
Total number of hospital contacts	1485	5 (11)	884 (58)	8.5 (13)	601 (40)	3 (7.25)
Number of hospital contacts by care setting						
Super acute and acute	926	3 (5.75)	524 (57)	4 (7.5)	402 (43)	2 (5.25)
Chronic	364	1 (3)	226 (62)	1 (5)	138 (38)	0 (2)
Mental health	42	0	35 (83)	0	7 (17)	0
At home	30	0	21 (70)	0	9 (30)	0
Number of contacts by care level						
Outpatient	1024	3 (7)	562 (55)	5 (10)	462 (45)	2 (6)
Inpatient	261	0 (2)	182 (70)	1 (3.25)	79 (30)	0 (1)
Emergency	200	0 (1)	140 (70)	1 (2)	60 (30)	0 (0.25)

IQR: interquartile range

Participants had contact with 34 departments overall; the departments with the highest frequency of contact (five departments with highest total visits) are displayed in **Figure 3.1.** 20% of total hospital contacts were with the A&E department, followed by the hospital wards (12%). Additionally, approximately 69-75% of the total contacts with the A&E and ward departments was made up of the nutritionally high-risk group. 9% percent of total cohort had contact with the elderly care unit, of which 83% of the total contact within this department was among the nutritionally high-risk group. Interestingly, 78% of the physiotherapy or musculoskeletal department contacts were

among the low nutritional risk group. The two main documented reasons for hospital contact were respiratory conditions and falls, of which 75% and 82% was among the nutritionally high-risk group, respectively (data not shown).

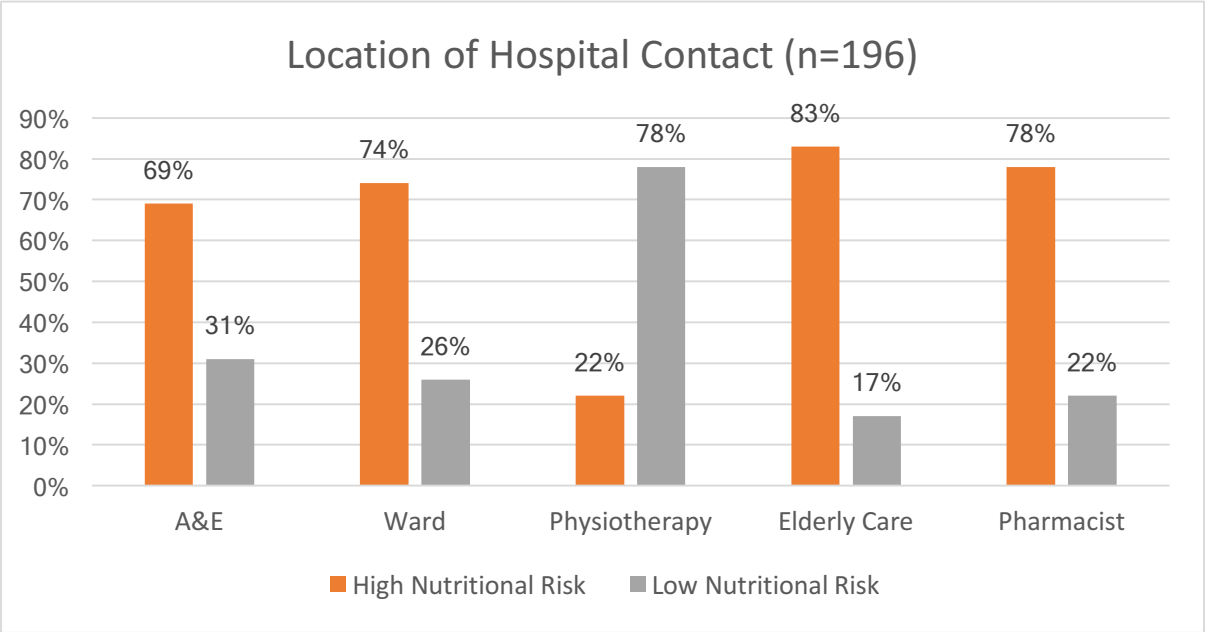


Figure 3.1 Location of Hospital Contact

Participant contacts with non-dietetic healthcare professionals in hospital are summarised in table 3.4**.** The total number of contacts with healthcare professionals in the hospital setting was greater in the high risk group then in the low risk group with the group at high nutritional risk accounting for 71% of total contacts. The greatest number of contacts in the total cohort was with physicians (44%) followed by 20% of contacts with nurses and 11% with physiotherapists, of which most contacts were again among the nutritionally high risk subset.

Table 3.4: Hospital contacts with healthcare professionals according to nutritional risk category (n=196)

	Total (n=196)		**High Nutritional Risk (n=82)**		**Low Nutritional Risk (n=114)**	
	Total count (n)	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**
Total number of contacts with healthcare professions	1154	1(87.5)	840 (73)		314 (27)	
Physicians[a]	519	0 (4)	403 (78)	4 (8)	116 (22)	0 (1)
Nurses[b]	303	1 (2)	184 (61)	1 (3)	119 (39)	0 (1)
Physiotherapists	130	0 (1)	92 (71)	0 (2)	38 (2)	0
Occupational Therapists	77	0	63 (82)	0 (1)	14 (18)	0
Pharmacists	68	0	53 (78)	0 (1)	15 (22)	0
Endoscopists	37	0	37 (100)	0	0	0
Speech & Language Therapist	14	0	8 (57)	0	6 (43)	0
Dentist	6	0	0	0	6 (100)	0

IQR: interquartile range
[a]includes: registrars, consultants, surgeons, fellows, professors & specialists
[b]including nurse specialists & practitioners

3.3.2.2 Community

Only half (n=102) of the participants were receiving community healthcare services (**Table 3.5**), the majority (76%) being in the high nutritional risk group. Thus, participants at high nutritional risk had a greater total number of contacts with community services compared to the low nutritional risk group (n=193 vs n=93, respectively), making up ¾ of the total contacts. Thirty-two percent of total community service contacts were with the district nursing services, followed by 18% with CRAFS, with three quarters (76%) of these being accounted for by the group at high nutritional risk (table 3.5).

Table 3.5: Community contacts by service according to nutritional risk category (n=196)

	Total (n=196)		**High Nutritional Risk (n=82)**		**Low Nutritional Risk (n=114)**	
	Total count (n)	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**
Number of participants who received community services N(%)*	102 (51)		62 (76)		37 (33)	
Total number of contacts with community services	266	1 (3)	193 (73)	2 (3.25)	73 (27)	0 (1)
District Nursing Services	87	0 (1)	66 (76)	1 (1)	21 (24)	0
CRAFS	46	0	35 (76)	0 (1)	11 (24)	0
AT Home Service	22	0	18 (82)	0	4 (18)	0
Podiatry	45	0	23 (51)	0 (1)	22 (49)	0
Supportive Discharge	10	0	6 (60)	0	4 (40)	0
Rapid Response	18	0	15 (83)	0	3 (17)	0
Neurorehabilitation	10	0	6 (60)	0	4 (40)	0

CRAFS: community reablment and falls service; IQR: interquartile range

Participants in the high-nutritional risk group also had a greater number of contacts with individual HCPs in the community compared to the low nutritional risk group, with 74% being accounted for by the high nutritional risk group (**Table 3.6**). The highest proportion of total healthcare contacts within the community were with allied healthcare professionals (AHPs), specifically nurses (40%) and physiotherapists (22%), with fewer contacts with other healthcare professionals. Similar to the above, the majority of contacts were in the nutritionally high-risk group. The fewer contacts with community services in the low nutritional risk group is reflected in the fewer contacts with individual HCPs in this group. In the whole cohort, few contacts were made with physicians in the community.

Table 3.6: Community contacts with healthcare professionals according to nutritional risk category (n=196)

	Total (n=196)		**High Nutritional Risk (n=82)**		**Low Nutritional Risk (n=114)**	
	Total count (n)	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**	**Total count n (%)**	**Median (IQR)**
Total Number of HCPs contacts	254	0 (2)	189 (74)	2 (1)	65 (26)	0 (1)
Nurses[a]	101	0 (1)	82 (81)	1 (2)	19 (19)	0
Physiotherapists	56	0	41(73)	0 (1)	15 (27)	0
Podiatrist	36	0	19 (53)	0	17 (47)	0
OT	16	0	13 (81)	0	3 (19)	0
SLT	12	0	8 (67)	0	4 (33)	0
MDTs	10	0	7 (70)	0	3 (30)	0
Rehab support worker	6	0	5 (83)	0	1 (17)	0
Matron, social or primary worker	3	0	2 (67)	0	1 (33)	0
Joint Physio/OT	1	0	1 (100)	0	0	0
Pharmacist	1	0	1 (100)	0	0	0
Physician[b]	1	0	1 (100)	0	0	0

HCP: healthcare professionals; IQR: interquartile range; MDT: multidisciplinary team; OT: occupational therapist; SLT: speech and language therapist
[a]includes: including nurse specialists & practitioners
[b]includes: registrars, consultants, surgeons, fellows, professors & specialist

3.3.3 Nutritional Documentation

Nutritionally high-risk patients were more likely to have relevant nutritional parameters recorded during hospital contacts than during community contacts, and again this was more likely during an inpatient stay than on contact with an outpatient clinic. However, analysis from the adjusted logistic modelling demonstrated no association between nutritional risk groups and any parameter of documented nutritional care in both hospital and community settings, except for referral to a dietitian on contact with hospital services, **Table 3.7**. There was a 2% reduction in risk of referral to a dietitian for participants at high nutritional risk (OR 0.202, 95%CI 0.064-0.636). Descriptions of documented nutritional care for the total cohort and for

the two nutritional risk categories are described below for hospital and community settings (**Table 3.8 and Table 3.9).**

Table 3.7: Associations between nutritional risk category and nutritional documentation in hospital and community settings (n=196)

	Nutritional Risk Status[a]					
	Unadjusted			Adjusted[b]		
Hospital	**OR**	**95%CI**	**p-value**	**OR**	**95%CI**	**p-value**
First-line Identification	0.335	(0.185-0.607)	p<0.001	0.621	(0.294-1.315)	p=0.214
Nutritional Screening	0.185	(0.086-0.399)	p<0.001	0.608	0.241-1.534	p=0.292
Dietitian Referral	0.105	(0.038-0.288)	p<0.001	0.202	0.064-0.636	p=0.006
First-line management	0.352	(0.194-0.637)	p<0.001	0.543	(0.259-1.136)	p=0.105
Community						
First-line Identification	0.337	(0.069-1.651)	p=0.180	0.364	0.080-2.521	p=0.364
Nutritional Screening	0.218	(0.026-1.849)	p=0.163	0.197	0.019-2.064	p=0.175
Dietitian Referral	-	-	-	-	-	-
First-line management	0.509	(0.205-1.262)	p=0.145	0.682	0.236-1.971	p=0.479

CI: confidence interval; OR: odds ratio
[a]Independent variable (high nutritional risk vs. low nutritional risk)
[b]Adjusted for: age, total comorbidity score, frailty score, and recruitment setting

3.3.2.1 Identification and first-line management

Overall, documentation of relevant nutritional parameters required for the accurate identification of nutritional risk status (i.e. current weight, recent (%) weight change, height, BMI, and MUST screening) and first-line nutritional management (assessment, advice and monitoring) by non-dietetic HCPs in both hospital and the community varied from 0-39%. Documentation of relevant nutritional parameters (identification and management) was much more likely to occur on contact with hospital (table 3.8) than community services (table 3.9) and was more likely during an inpatient than an outpatient contact (data not shown). Even on contact with hospital

services (inpatients and outpatients), documentation was sub-optimal and did not comply with national guidelines with only 78 (39%) participants being assessed for nutritional risk status in hospital. Trust guidelines state that 100% of hospital inpatients should have MUST screening undertaken within 24 hours of admission and weekly throughout hospital stay. 21% participants had a documented MUST score on inpatient hospital contact, and only 13% had a repeat screen performed during hospital stay (table 3.8).

During hospital contacts, fewer than 1 in 3 nutritionally high-risk participants had a documented referral to a dietitian and less than 2% of high risk participants had a documented referral to a dietitian during community contacts (table 3.9). 77 (39%) of participants were documented as receiving first line nutritional management on contact with hospital services and 32 (31%) of participants were documented as receiving first-line nutritional management on contact with community services (table 3.9). Interestingly, the proportion of participants with documented first-line management in the community (31%) was higher than those with documented evidence of identification of nutritional risk (e.g. screening, weight, BMI recorded).

3.3.2.1.1 Type of first line management

First-line management which may be performed by non-dietetic HCPs included documentation of nutritional assessment, advice or monitoring (defined in appendix 2). The types of nutritional assessment and advice documented in the hospital and community settings are detailed in **Appendix 5**. Most nutritional assessments consisted of a question regarding weight loss (e.g. “have you lost weight?”) and nutritional screening followed by an assessment of oral intake (e.g. ‘have you had any appetite changes?’ or an

eating/drinking assessment). In the community, documented assessments only comprised a question on oral intake (appendix 5). Most of the nutritional advice comprised of advice on general dietary changes or advice related to swallowing difficulties or interventions for dysphagia. Documentation of nutritional monitoring was in the form of nursing records and food charts for all the participants in hospital only.

Table 3.8: Documentation of nutritional care by non-dietetic healthcare professionals on hospital contact according to nutritional risk category (n=196)

	Total (n=196)	**High Nutritional Risk (n=82)**	**Low Nutritional Risk (n=114)**
First-line Identification (N%)			
Weight or BMI recorded or nutritional screening performed	78 (39)	45(55)	33(29)
Nutritional screening performed only (MUST)	41(21)	30(37)	11(10)
Nutritional screening repeated (MUST)	25(13)	19(23)	6(5)
Dietetic Referral	30(16)	25(31)	5(4)
First-line management			
Any nutritional assessment, advice, or monitoring performed	77 (39)	44(54)	33(29)
HCP providing nutrition care N (%)[a]			
Physician	57	39 (68)	18 (32)
Nurse	42	25 (60)	17 (40)
OT	20	13 (65)	7 (35)
Physiotherapist	14	9 (64)	5 (36)
Other	8	5 (63)	3 (37)
SLT	6	4 (67)	2 (33)
Pharmacist	1	1 (100)	0

BMI: body mass index; MUST: malnutrition universal screening tool; OT: occupational therapist; SLT: speech and language therapist

[a]N= sum of contacts

Table 3.9: Documentation of nutritional care by non-dietetic healthcare professionals on community service contact according to nutritional risk category (n=196)

	Total (n=102)	**High Nutritional Risk (n=62)**	**Low Nutritional Risk (n=37)**
First-line Identification (N%)			
Weight or BMI recorded or nutritional screening performed	13(13)	11(18)	2(5)
Nutritional screening performed only (MUST)	8(8)	7(11)	1(2)
Nutritional screening repeated (MUST)	0	0	0
Dietetic Referral	1(0)	1(2)	0
First-line management			
Any nutritional assessment, advice, or monitoring performed	32(31)	23(37)	9(24)
HCP providing nutrition care N(%)[a]	43	32 (74)	11 (26)
Nurse	29	22 (76)	7 (24)
Physiotherapist	3	3 (100)	0
SLT	8	7 (88)	1 (12)

BMI: body mass index; MUST: malnutrition universal screening tool; SLT: speech and language therapist
[a]N= sum of contacts

3.3.2.2 Non-dietetic HCPs involved in nutritional care

Most instances of documented identification and first-line nutritional management by non-dietetic HCPs were by physicians and nurses in the hospital setting. Physiotherapists and occupational therapists were the professions next most likely to record nutritional care within the high nutritional risk group (table 3.8). Physiotherapists and occupational therapists mainly assessed patients as part of the comprehensive geriatric assessment and activities of daily living (ADL)

questionnaires using the questions related to meal preparation. This was different in the community setting, where most HCPs recording nutritional assessment or advice were nurses followed by SLTs and physiotherapists (table 3.9). Perhaps unsurprisingly, the overall number of contacts with non-dietetic HCPs assessing and providing nutritional care was fewer among the low nutritional risk group as compared to the high nutritional risk group. This was the case in both hospital and community settings.

3.3.2.3 Dietetic contacts

Information on contact with a dietitian across healthcare settings is provided in **Figure 3.2**. Most dietetic contacts ("at least once" and "repeated contact") occurred in the hospital inpatient setting and were less likely to occur in the outpatient and community settings. Overall 34 of the total participants (17%) had contact with a dietitian over the course of the year. A greater proportion of participants in the high nutritional risk group had contact with a dietitian during the study compared to participants in the low nutritional risk group cohort (28 (82%) vs 6 (18%) respectively), with the majority seen as inpatients (figure 3.2).

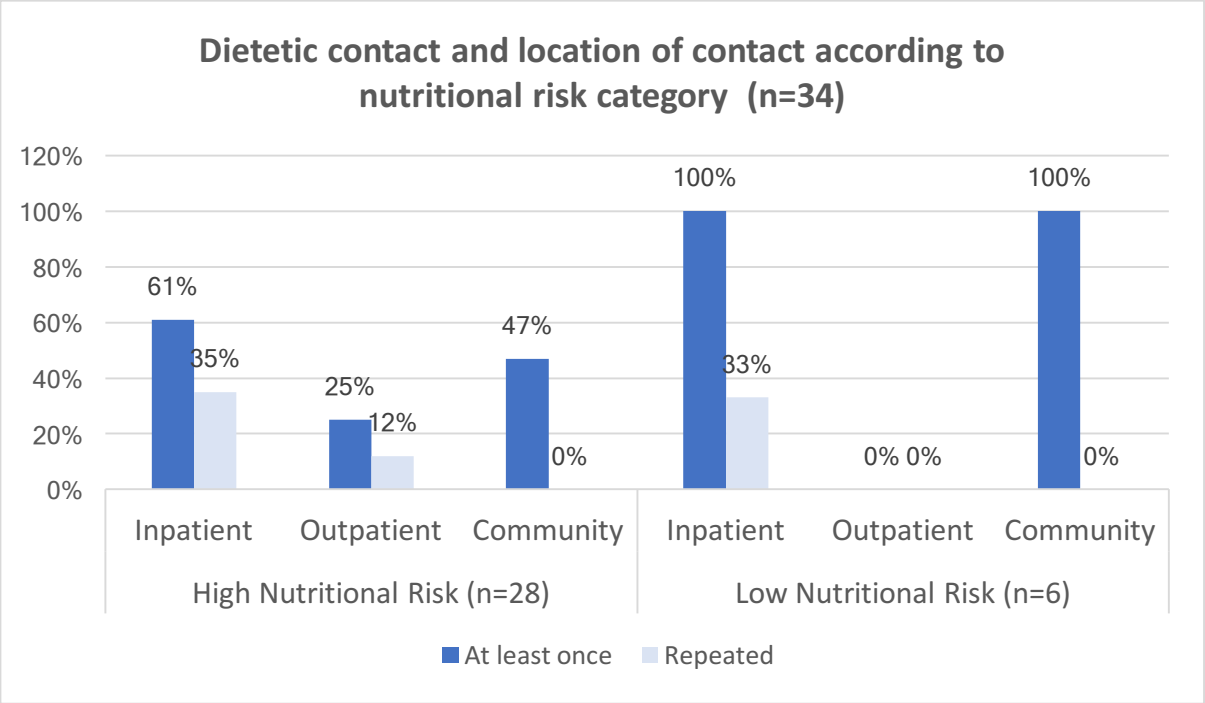


Figure 3.2 Dietetic contact and location of contact according to nutritional risk category

3.4 Discussion

3.4.1 Healthcare Contacts and Nutritional Documentation

This chapter aimed to explore the healthcare contacts and documented nutritional care of community dwelling older adults and the associations between nutritional risk status and healthcare contacts and documented nutritional care. To my knowledge, this is the first study to quantify and characterise these contacts with non-dietetic and dietetic HCPs and to explore the provision of nutritional care within these contacts across healthcare settings. Findings will be discussed in the context of the gaps and opportunities within the process and draw out conclusions which will inform the next chapters of the thesis.

In summary, findings from this study demonstrated four key trends. Firstly, although participants categorised at high nutritional risk accounted for less than half of the participants, they accounted for more than ¾ of contacts in hospital and community. The high nutritional risk group also had a significantly greater number of contacts with healthcare services, departments and professionals compared to the low nutritional risk group in both the hospital and community settings.

Second, consistent throughout, the greater proportion of participants identified or with nutrition documented was also among the nutritionally high-risk group. However, while this was the case, there was no significant association between nutritional risk status and nutritional documentation among the participants.

Third, nutritional practices appeared to be ad hoc and one-off procedures rather than routine and standardized practices. As a result, a significant proportion who were

identified as at high risk of malnutrition by the researchers, were not identified as such by HCPs they encountered throughout the year of study.

Lastly, irrespective of nutritional risk status, healthcare contacts and nutritional documentation were more likely to occur in hospital (predominantly in inpatients) than in the community setting.

The model within this study exploring the impact of nutritional risk on healthcare contacts adjusted for confounders associated with nutritional risk such as more comorbidities, higher frailty, and recruitment setting (where IC participants maybe sicker than GP participants). This demonstrated the impact of nutritional risk, independently, on the healthcare services, adding to the evidence base of the burden of malnutrition on the health and community care system. Additionally, this study demonstrates the many opportunities healthcare professionals have to identify and prevent malnutrition throughout an older person's healthcare journey.

Malnutrition can arise at any time throughout the individual's disease pathway and this suggests the need for repeated nutrition risk screening across healthcare settings. Our study showed that nutritional screening did not happen routinely in the community and, although screening happened more often (20%) in hospital (predominantly in inpatients), it was rarely repeated. Missed identification and sub-optimal management results in poor outcomes on the individual's health (Elia, 2015). Primarily cross-sectional studies have shown that both nutritional screening and subsequent referral to dietitians by HCPs is inadequate. A systematic review of nutritional screening interventions across settings highlighted that more than half of individuals are identified at nutritional risk (Elia et al., 2005). More recently, within the UK, cross-sectional evaluation of nutritional screening across three elderly care

wards highlighted that fewer than 60% of patients had documented nutrition screening on admission (Farrer et al., 2013). Over a one year period, findings in this cohort study demonstrated that nutritional practices such as nutritional screening were one-off procedures rather than a process of assessment, referral and management and review. The results highlight that nutritional interventions and monitoring occurred less frequently than recommended in trust and national clinical guidance. This could be a result of several factors within the hospital, including lack of knowledge or standardized implementation of policy, short hospital stays, or lack of facilities to assess and measure or patients being bed bound and unable to be assessed. Additionally, the majority of nutritional screening tools fail to provide don't provide guidelines on the interventions steps for follow up.

The results show that nutritional screening and nutritional procedures are rarely carried out in outpatient and community settings. Few studies have evaluated nutritional screening in outpatient and community settings, with the majority focused on hospital inpatients. Nutritional screening surveys within the UK have shown that approximately 30% of individuals admitted to hospital and 15% of those in the outpatient setting are at risk of malnutrition, with most individuals at risk (93%) living in the community (BAPEN, 2014; Vanderwee et al., 2010). Thus, contact with outpatient and community settings is key to appropriately identify individuals at risk who may benefit from nutritional interventions. The potentially beneficial impact of the inclusion of formal nutritional screening procedures within clinical practice has been highlighted by several studies. One pre-post controlled study (n=200) evaluating compliance with nutritional guidelines, which included nutritional screening, assessment and support within a stroke ward in the UK, highlighted improved patient outcomes such as decreased chest infections, decreased time for providing nutritional

support, and increased referral to a dietitian (Perry & McLaren, 2003). Furthermore, provision of nutritional support after appropriate nutritional screening has also shown benefits on patient outcomes. One study implementing a nutritional screening protocol followed by appropriate intervention (e.g. dietary changes, oral nutrition supplements, hydration) for individuals identified at risk within a multidisciplinary geriatric ward (n=298), highlighted significantly improved weight and decreased infections in the group receiving nutritional care compared to usual care (Rypkema et al., 2004). Similarly, individualised, protocol guided nutritional support intervention was found to improve clinical outcomes among nutritionally at-risk inpatients (Schuetz et al., 2019). However, this evidence highlighted focuses on the hospital setting, with limited evidence in the outpatient and community, resulting in a lack of data on the strategies in the community. It is not surprising among our findings, that majority of contact with healthcare departments and professionals were among the high-risk category, since risk of malnutrition is associated with high use of healthcare resources (Elia, 2015). Malnourished individuals have increased hospital admissions and re-admissions, increased length of stay, increased need for discharge support, and are more likely to visit the GP when compared to well-nourished individuals (BAPEN, 2018).

Nutritional screening occurred exclusively in hospital settings with no participants being screened in the community. Trust community screening policy has been in place since 2014. In addition to many high risk participants not being identified, only a few individuals were referred and seen by a dietitian, especially in the community (n=1 only seen by the dietitian). Lack of nutritional screening often results in under-treatment of nutritional issues and infrequent dietetic referrals (Dent et al., 2014). While most high risk participants in our study were identified in the hospital setting,

which may be due to formal protocols embedded in inpatient hospital settings, very few were identified in the outpatient and community settings. However, despite protocols in the hospital setting, nutrition screening remains suboptimal. Factors such as short hospital stays and people being bedbound may cause barriers to implementation, which may not occur in the outpatient and community setting. Similar results to those found in the current study have been reported by Marshall et al. (2015) in a study evaluating discharge of older adults (n=30) from hospital for community rehabilitation. Approximately half of the participants, who were identified as either moderately or severely malnourished, were referred to a rehabilitation dietitian within the hospital however, no participants were referred to a community dietitian at discharge (Marshall et al., 2015). A limitation of this study is the small sample size, thus this may not be representative or generalizable to other healthcare systems or settings. There was a lack of nutritional documentation in the community setting in both cohorts. Pathways for nutritional care focus on the acute setting with limited links across the hospital and community boundaries(Elia, 2015; Marshall et al., 2015).

A third aim of the current study was to explore the gaps and opportunities for developing cross-boundary nutritional care pathway(s) and/or interventions. The majority of healthcare contacts were within outpatient settings where nutritional identification did not appear to be part of routine clinical practice. Thus, outpatient clinics may be a setting in which to focus on effective nutritional screening and referral pathways. However, strategies must consider the time allowance and prioritisation of staff in busy outpatient clinics. Thus, clear, quick tools and pathways should be considered (Keller et al., 2019), or innovative strategies such as self-screening (McGurk et al., 2013). Additionally, consideration of key departments visited by the

different cohorts highlight where resources may be best targeted for the development of intervention strategies. For example, focusing screening interventions on clinical areas where patients have many contacts and where there is likely to be a high proportion of nutritionally at-risk patients e.g. patients attending respiratory clinics for COPD or as part of multidisciplinary geriatric assessments. However, as highlighted in chapter 1, screening alone is not sufficient and formal pathways and clear referral criteria are needed to incorporate nutrition into clinical practice (Weekes et al., 2009; Keller et al., 2019).

Only about one third of total individuals were referred to a dietitian and overall nutritional practices did not significantly differ between the nutritional risk groups. A possible explanation for referral may be that screening was performed among those who 'appear' to have a nutritional problem or that referral was being prompted without nutritional screening as a result of clinical judgement. In an audit evaluating the rate of screening among nurses in four hospital wards across three hospitals in Australia (Raja et al., 2008), screening was found to be performed in only 25% of patients using the MUST tool and 4% of patients using the MST by nurses. Qualitative results from the audit highlighted that nurses applied individual judgement rather than the tool to assess malnutrition risk (Raja et al., 2008).

3.4.2 Strengths and Limitations

This study is the first to explore and quantify the number and locations of healthcare contacts and documented nutritional care within the hospital and community care settings. The strength of the longitudinal nature of the cohort study allowed us to identify the total contacts and nutritional care documentation over a one-year period. However, it is important to note the limitations of this exploratory study which should

be interpreted with caution. No formal sample size was calculated thus this may not provide the effective power needed to identify the true differences when comparing between high nutrition risk and low nutrition risk groups and their associations with outcomes. Nevertheless, the exploratory nature of the study provides groundwork and raises key questions to base future research on, which will be highlighted in the next chapters of this thesis. These include: (1) Can non-dietetic HCPs in key contact provide nutritional care and (2) how can we target multidisciplinary teams and departments well position for the prevention of malnutrition risk among nutritionally vulnerable older adults? (3) What are the reasons, barriers, and facilitators behind HCPs nutritional practices? Additionally, an attempt was made to minimize human errors and increase the reliability of the data during electronic record collection through a second round of data collection and standardization of definitions. There may be some missing information because of incomplete documentation within electronic health records. Some participants may have seen a HCP however, the data did not appear or was not uploaded on the system, which may result in a lack of accuracy among the data and should be interpreted with caution. Furthermore, it is important to recognize that some participants may have had many more contacts and others had much fewer, potentially contributing to outliers and possible skewness of the dataset. However, the total contacts among all participants were important to explore which key departments and professions have the most contact, thus the total number of contacts (or sum) were of interest to report and no outliers were removed. Lastly, due to the EHR platform and time limitations of the PhD, primary care records were not accessed, and this results in lack of data on contacts with these services, specifically general practice.

3.5 Conclusions

This study provided information on the number and locations of healthcare contacts among a subset of community-dwelling older adults followed up over a one year period. However, despite numerous contacts, nutritional risk remained undetected among our cohort of older adults. Improved strategies for the detection and management of malnutrition in the community are needed. This study provides a premise for the involvement of non-dietetic HCPs and targeting key departmental locations where older adult populations may come in contact for identification, first line management and onward referral of malnutrition. Before strategies to involve non-dietetic HCPs can be put into place, further research is needed to understand (1) the reasons, barriers, and facilitators behind HCPs choosing to provide nutritional care and their ability to provide nutritional care within their roles, (2) whether non-dietetic HCPs are able to provide effective nutritional care to nutritionally vulnerable older adults? (3) how can we target and support well-positioned multidisciplinary teams and departments in supporting nutritional service provision.

Chapter 4: Systematic Review and Evaluation of Intervention Reporting

Prologue

Results from chapter 3 (cohort study) highlighted the numerous contacts nutritionally vulnerable older people have with non-dietetic HCPs across the hospital and community settings and the absence of nutritional actions. Thus, these are potentially missed opportunities for timely identification and management of malnourished patients. Evidence is needed to identify instances where non-dietetic HCPs have been able to provide effective first line nutritional interventions and appropriate first line actions to manage malnutrition in the community. Limited evidence is available on the types of nutritional interventions which may be provided by non-dietetic HCPs, the types of settings in which they have been delivered and the efficacy of these nutritional interventions on patient outcomes. In addition, it is important to explore the quality of reporting of the nutritional interventions which affects their replicability. This chapter sets the scene toward understanding the role that non-dietetic HCPs, who may be involved in the care of adults at nutritional risk can take.

A manuscript **(Appendix 6)** was published from this systematic review which forms the first section of this chapter (section 4.1), followed by the evaluation of the reporting of interventions (section 4.2):

Dabbous, M., Hastings, R., Weekes, C. E., & Baldwin, C. (2021). The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: a systematic review. *Clinical Nutrition*.

4.1 The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: a systematic review

4.1.1 Introduction

Malnutrition, characterized as undernutrition (Cederholm et al., 2019; Sobotka & Forbes, 2019), is estimated to affect over three million people in the UK and 33 million people across Europe (Elia & Russell, 2009; Ljungqvist & De Man, 2009). Nutritionally at risk or malnourished individuals in the UK have triple the number of hospital admissions, twice the number of visits to general practices (GPs), increased length of hospital stay, increased morbidity and mortality, and impaired psycho-social functioning when compared to adequately nourished individuals (Guest et al., 2011; Holdoway et al., 2017), thus, resulting in an increased demand for health and social care services (Elia, 2015; Ljungqvist & De Man, 2009). While a lack of consensus on the diagnostic criteria remains (Cederholm et al., 2017; Cederholm et al., 2015), reduced nutrient intake may result in the development of malnutrition without disease where contributory factors such as age, social isolation, mobility, poverty and psychological wellbeing are frequently involved in patients in the community (Cederholm et al., 2017; Cederholm et al., 2015; Elia & Russell, 2009). In the hospital setting, additional contributory factors include provision of meals that are not individualised to a patients' need or insufficient help with feeding (Kimber et al., 2015). Timely identification and management of malnutrition is therefore fundamental towards improving individual's health risk and decreasing its impact on healthcare costs.

Dietitians are uniquely qualified to treat malnutrition, yet they have among the lowest health care professional (HCP) numbers in the UK with about 4,176 dietitians employed by the NHS compared to 286,215 nurses and health visitors (NHS Digital, 2018b). Similarly in Europe, there are 600,000 practicing dietitians (European Federation of the Associations of Dietitians, 2012) compared to approximately 3.1 million practicing nurses (Eurostat, 2020). UK and European data on dietetic to patient staffing ratios is limited, however, considering that three million people at any given time may be experiencing malnutrition in the UK, and assuming that one dietitian has the capacity to safely consult up to 72 patients in any given month (British Dietetic Association, 2020b), then at least 42,000 dietitians are needed just to consult with patients for malnutrition alone. Thus, the burden of malnutrition is evidently too high for current dietetic workforce numbers to handle on their own, and malnutrition remains under-recognised and under-treated across settings (Elia et al., 2005).

Given the multifactorial nature of malnutrition, there is scope for HCPs who are not specialists in managing nutrition, to play a key part in the prevention and first line management of malnutrition to ensure appropriate and timely support across healthcare and community settings through cross profession working (NICE, 2017). The role of non-dietetic HCPs in delivering nutritional screening has become a recognised role in some areas of healthcare (Green & James, 2013). Reviews have also identified beneficial effects of nutrition training of support staff on patient outcomes (Marples et al., 2017; Mogre et al., 2016). However, the nature and breadth of nutrition interventions delivered by non-dietetic HCPs has not yet been synthesised among the nutritionally at risk or malnourished. One systematic review evaluated the effectiveness of nutrition care delivered by HCPs working in primary care, however this review was not specific to the management of malnutrition and included the range

of chronic diseases seen in primary care (Ball et al., 2015). Recently, the effects of nutritional interventions carried out by nursing staff for older adults in hospital, institutional and community settings on malnutrition related outcomes, identified four main intervention types: oral nutritional supplements, food/fluid fortification or enrichment, dietary counselling and educational interventions (Ten Cate et al., 2020). There is a need to identify the range of interventions able to be delivered by all HCPs. To our knowledge, there are no systematic reviews documenting the breadth of nutritional interventions in adults at risk of malnutrition undertaken by all non-dietetic HCPs and investigating their effects on patient outcomes. This systematic review aimed to identify and characterise nutritional interventions for the management of malnutrition delivered by non-dietetic HCPs and to collate evidence on their effectiveness on nutritional, patient and healthcare-related outcomes across all healthcare and community settings.

4.1.2 Methods

The systematic review was performed in accordance with the PRISMA and Cochrane guidelines for systematic reviews and meta-analyses (Higgins et al., 2020; Moher et al., 2015). The review is part of a larger systematic review examining the role of HCPs, carers and trained volunteers in the management of malnutrition in adults and the protocol is registered on PROSPERO (registration number: CRD42018092320).

4.1.2.1 Eligibility Criteria

The study eligibility criteria using the Patient, Intervention, Comparison, Outcomes, Study type (PICOS) format is described in **Table 4.1**.

4.1.2.2 Search methods and study selection

Three databases were searched on 10th October 2019 with no limitations on date, language or status of publication (PubMed, Ovid MEDLINE and the Cochrane Central Register of Controlled Trials (CENTRAL) which includes ClinicalTrials.gov and World Health Organisation (WHO) ICTRP (International Clinical Trials Registry Platform). Further studies were identified through snowball searching of reference lists of included studies, relevant systematic or narrative reviews and citation searching (for studies that met the inclusion criteria). The search strategy is provided in (**Appendix 7**). Search terms were truncated where appropriate and MeSH terms applied where possible. The search was limited to exclude animals, children, adolescents, pregnancy, artificial nutrition, and overweight or obesity.

All search results were imported into Mendeley Desktop (v1803) or EndNote X8 library where they were processed for removal of duplicates and screened for inclusion or exclusion independently by two review authors (MD and RH). RH was a final year undergraduate student who supported completion of this review which included duplication of study selection, data extraction and assessment of risk of bias (ROB). On initial screening, titles and abstracts were compared to inclusion and exclusion criteria using the PICOS format (table 4.1) and those that met the inclusion criteria, or where eligibility was unclear from the abstract, were processed for further screening. On second screening, all identified papers from initial screening were retrieved in full text and examined against inclusion criteria. Reasons for exclusion were noted for ineligible studies. Ongoing trials that are currently unpublished and articles not in English that could not be translated, that met or possibly met the inclusion criteria were also noted but excluded from this in this review (details in results section below).

Any discrepancies were resolved by discussion with the PhD supervisors (CEW and CB).

4.1.2.3 Data Extraction and Synthesis

Data were extracted from the studies that met inclusion criteria by RH and MD and displayed in a standardized table for comparison. Data extracted included characteristics of study population (patient and type of HCP, number of participants and participant characteristics), intervention, comparator, outcomes, study design and setting. The preliminary synthesis was guided by Cochrane guidelines (Popay et al., 2006; Ryan, 2013) and data were grouped according to primary and secondary outcomes within intervention categories. The types of interventions within these categories were summarised. For all outcome data, results were displayed in tables where possible and synthesized narratively. Due to lack of similarity between interventions and variation in how outcomes were assessed and reported, a meta-analysis was not possible for this review. Data were described according to number of studies reporting an outcome, number reporting statistically significant results ($p < 0.05$), intervention type and setting.

4.1.2.4 Risk of bias and quality of evidence

Risk of bias for randomised controlled trials (RCTs) was assessed using the Cochrane Collaboration's Risk of Bias Tool (RoB 2) (Sterne et al., 2019). Non-RCTs and observational studies were assessed using ROBINS-I tool as described in the Cochrane handbook (Higgins *et al.*, 2019) and qualitative studies were assessed using the modified CASP checklist. Results were tabulated using Review Manager (Manager, 2014) with a +, - or ? to represent high, low or unclear bias respectively. Any discrepancies were resolved by discussion with a third co-author.

Quality of evidence for each main outcome was determined using the GRADE approach according to Cochrane guidelines (Higgins et al., 2020) by RH and MD. Factors that reduced quality were risk of bias, imprecision, inconsistency of results, indirectness of evidence and publication bias. Any large magnitude of effect, dose response gradient and plausible residual confounding was used to increase quality. The grading was rated as very low, low, moderate or high for each outcome and was outlined in a summary of findings table with reasons for downgrading quality included in the footnotes. Where insufficient statistical data were available to summarise effect size, results were displayed narratively.

Table 4.1: PICOS eligibility criteria

PICOS	Inclusion Criteria	Exclusion Criteria
Population	(1) Non-dietetic HCPs defined as having completed professional training recognised by appropriate regulatory bodies to provide healthcare services to patients. Professional assistants such as nursing and health care assistants were considered. (2) Adults (>18 years) who were malnourished or at risk of malnutrition. Malnutrition and malnutrition risk was defined by study authors or according to baseline characteristics and included patients who were hospitalised or had conditions associated with malnutrition.	Patients who were fed enterally or parenterally were excluded. Dietitians and dietetic assistants were excluded. Studies focusing on obesity and its co-morbidities were excluded. Enteral and parenteral nutrition interventions, and interventions aimed at 'testing' a supplement only (vitamin D, ONS) were also excluded. Children and adolescents (<18 years) were excluded.
Intervention	Any nutritional intervention addressing prevention or treatment of malnutrition that was carried out by non-dietetic HCPs were considered. All settings were included (hospital, outpatient clinic, home, nursing home).	Telehealth interventions (e.g. telephone interventions) Studies in economically developing countries as the aim of the intervention and mode of delivery is likely to be substantially different from those in more developed countries.
Control or Comparison	Studies with and without a routine care comparator were included to broaden the scope of the review and to allow for inclusion of qualitative outcomes.	
Outcomes	Descriptions of types, settings and the modes of nutritional interventions provided. Primary outcomes: Nutritional intake (energy and protein intake), nutritional status (BMI, weight, % weight change or MAMC) clinical function (Activities of daily living), Quality of life, Morbidity, Mortality Secondary outcomes: Hospitalisation: length of stay Economic Cost Other outcomes: feasibility or acceptability by HCPs, patient satisfaction.	
Studies	All randomised controlled trials (RCTs), non-RCTs, non-intervention and qualitative studies.	

4.1.3 Results

A total of 17,458 records were identified through database searching and 78 studies underwent full text screening for eligibility (**Figure 4.1**). Eighteen articles met the inclusion criteria and were included in the review. Three studies not in English

(Kroner *et al.,* 2012; Zhou *et al.*, 2011; Liu *et al.*, 2018) were identified as probably eligible, however data were not extracted or summarized, as translation was not possible for the purpose of this review. One ongoing trial with no published results was also identified (IRCT20180314039097N1, 2018).

.

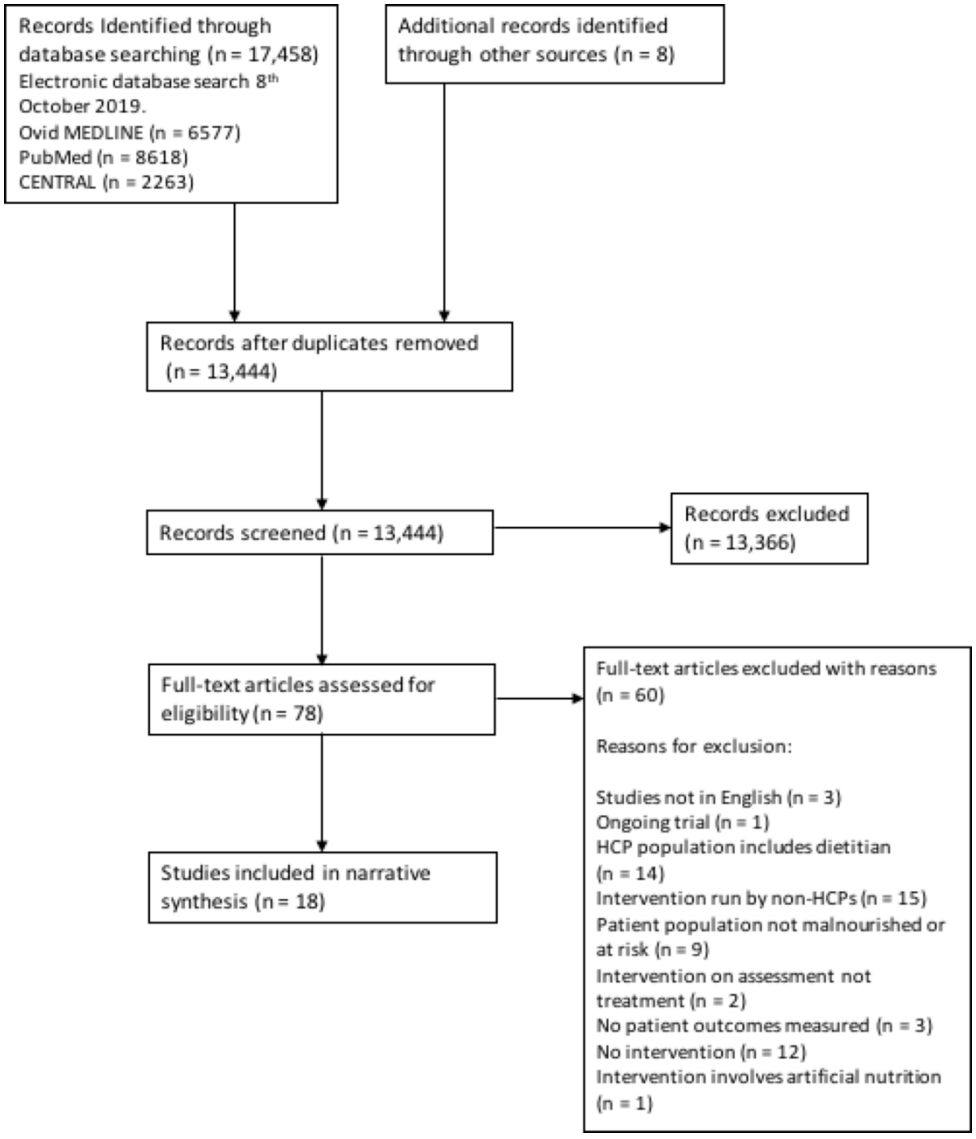


Figure 4.1. Flow diagram of study selection

4.1.3.1 Preliminary Synthesis

4.1.3.1.1 Description of Included Studies

Eighteen studies met the eligibility criteria and were included in this review involving non-dietetic HCPs **(Table 4.2).** The mean age of participants ranged from 53-86 years. Sample sizes varied from 19 to 592 participants. Five studies were based in Denmark, three in Sweden, two studies each in Finland, China and Taiwan, and one study each in USA, UK, Australia and Spain. Nine studies were hospital-based (Casals et al., 2015; Chen et al., 2019; Hickson et al., 2004; Holst et al., 2017; Lassen et al., 2008; Lassen et al., 2004; Olsson et al., 1998; Pedersen et al., 2012; Young et al., 2013; Zhou, 2016), of which one was continued in the community (Casals et al., 2015), six in nursing, long-term care or residential homes (Chang & Lin, 2005; Chen et al., 2016; Hollingsworth et al., 2018; Lorefält et al., 2011; Suominen et al., 2007; Wikby et al., 2009) and two were clinic based (Palvanen et al., 2014; Poulsen et al., 2007). The length of intervention and follow up varied from 16 days to 13 months. Participant diagnoses varied among the included populations; three studies included 70-100% of participants with dementia (Chang & Lin, 2005; Chen et al., 2016; Hollingsworth et al., 2018), one study included only patients with end-stage renal disease on haemodialysis (Zhou, 2016) one study included only patients with acute heart disease (Pedersen et al., 2012) and another study included gastrointestinal surgery patients (Chen et al., 2019). The remaining studies did not specify a diagnosis within their inclusion criteria. Thirteen studies reported nutritional status by measuring nutritional screening score or BMI (Casals et al., 2015; Chen et al., 2019; Hickson et al., 2004; Holst et al., 2017; Lassen et al., 2004; Lorefält et al., 2011; Olsson et al., 1998; Palvanen et al., 2014; Pedersen et al., 2012; Poulsen et al., 2007; Suominen et al., 2007; Wikby et al., 2009; Zhou, 2016). Seven of 18 (39%) studies reported on

nutritional risk status of participants at baseline with percentages at medium/high risk ranging from 13% to 89% of participants. Nutritional risk status was measured using a variety of screening tools, the MUST tool was used in one study (Casals et al., 2015), the MNA in four studies (Chen et al., 2019; Lorefält et al., 2011; Suominen et al., 2007; Wikby et al., 2009), and NRS 2002 tool in one study (Pedersen et al., 2012). One study measured the mean malnutrition inflammation score (Zhou, 2016). Mean BMI ranged from 22-27 kg/m^2 among participants. In addition, one study included nutritionally at risk older participants only (Hollingsworth et al., 2018) and one study reported the percentage of participants self-reporting weight loss over time (Lassen et al., 2008).

Table 4.2 summarizes the included studies based on the grouped nutrition intervention types described further below. Five studies involved feeding assistance (Chang & Lin, 2005; Chen et al., 2016; Hickson et al., 2004; Hollingsworth et al., 2018; Young et al., 2013), ten involved nutritional care plans (Casals et al., 2015; Lassen et al., 2008; Lassen et al., 2004; Lorefält et al., 2011; Olsson et al., 1998; Pedersen et al., 2012; Poulsen et al., 2007; Suominen et al., 2007; Wikby et al., 2009; Zhou, 2016), and three were multi-factorial interventions (Chen et al., 2019; Holst et al., 2017; Palvanen et al., 2014). Thirteen studies were delivered by nurses or nurse assistants, one involved healthcare assistants and four were mixed HCPs which included general practitioners, food service staff, physiotherapists, and social work assistants

Table 4.2: Summary of study characteristics according to type of nutritional intervention

Study ID	Study Design	Sample Size	Intervention and duration	Comparator	Setting	HCP Type and training	Patient Group (age, gender, diagnosis; inclusion/ exclusion)	Outcomes of Interest (Including those not reported in review)
				Feeding Assistance				
(Chang & Lin, 2005)	RCT	I: 20 C: 16	Feeding intervention at one mealtime after training ***Duration:*** 4 months	Usual care at mealtimes without prior feeding assistance training.	Long-term care facilities for dementia patients. Taiwan	***HCP:*** Nursing assistants ***Training:*** 4 hours training programme	***Diagnoses:*** Dementia (100%) ***Inclusion:*** Identified as having eating problems and in need of assistance. ***Age/Gender/ Exclusion*: U**navailable	Food Intake HCP Knowledge, attitude and behaviour EdFED, total eating time, food intake
(Chen et al., 2016)	Pre-post self controlled	30	Feeding intervention: feeding help, psychological care, nursing care after eating and patient monitoring. ***Duration:*** 3 months	None	Nursing Home. China	***HCP:*** Nurses ***Training:*** Lectures about protocol and hands-on supervision	***Diagnoses:*** Alzheimer's Disease with dysphagia (100%) ***Gender:*** 57% male ***Mean age:*** 82.4 (+/- 6.78) ***Inclusion***: no lung disease, age >60 yrs, ***Exclusion:*** severe pathologies of liver/ kidney/ blood/ primary disease of endocrine system. Past or current disease affecting	Food Intake TSF, MUAC, EdFED

							swallow, gastric/feeding tube, unstable vital signs.	
(Hollingsworth et al., 2018)	RCT	I: 62 C: 65	Feeding assistance at between-meal supplements and/or snack delivery ***Duration:*** 24 weeks	Trained non-HCPs.	Long-term care facilities USA	***HCP:*** Nursing assistants ***Training:*** None for nursing assistants. 8 hour course for non-HCPs.	***Diagnoses:*** Dementia (72.1%) ***Gender:***85.2% female ***Mean age:*** 85.6 (+/-9.6). ***Inclusion:*** long-stay residents at nutritional risk. ***Exclusion:*** order for hospice services, enteral/parenteral feeding, history of aspiration. **Other**: Nutrition status as defined by physician/ dietitian order for ONS and/or staff offers of additional foods and beverages between meals	Energy intake, Staff perspectives Average assistance time
(Hickson et al., 2004)	RCT	I: 259 C: 250	Feeding support for 2 meals, 5 days a week. ***Duration:*** 16 days (medium length)	Usual ward care	Hospital – Medicine for the elderly wards. UK	***HCP:*** Health-care assistants ***Training:*** 15 hours	***Gender:*** I: 68.5% female; C: 57.7% female. ***Mean age:*** 82 years. **Median BMI**: 21.7kg/m^2 ***Inclusion:*** >65yrs ***Exclusion:*** unable to eat orally, not expected to survive current admission, discharge planned within 4 days, readmitted having	Weight, MAMC, food intake, Barthel score BMI, MAC, TSF, HGS albumin

							already taken part in trial.	
(Young et al., 2013)	Pre-post	Pre: 115 Post: 139	Feeding assistance models, 1 of 3 on each ward: Protected mealtimes (PM); additional assistant in nursing (AIN); PM and AIN ***Duration:*** 6 months	Usual ward care	Hospital Australia	***HCP:*** Nurses, nursing assistants. ***Training:*** Facilitated sessions involving staff to help design intervention models. Practices reinforced throughout intervention	***Diagnoses:*** various ***Mean age:*** 80 +/-8 ***Gender:*** 51% female pre, 55% female post. ***Inclusion:*** >65yrs, hospital stay > 2 days, admitted from emergency department. ***Exclusion:*** Critically ill, no oral diet on admission.	Energy intake, protein intake, Activities of daily living index Feeding dependency
				Nutrition Care Plans				
(Casals et al., 2015)	RCT	I: 46 C: 47	Nutrition counselling by case manager nurses during hospital stay and post discharge based on nutritional risk status. Medium risk: dietary counselling after assessment, reassessed at 1 month High risk: dietary counselling & strategies for food	Standard treatment	Hospital (continues in community post discharge). Spain.	***HCP:*** Nurses ***Training:*** No additional training	***Diagnoses:*** various ***Mean age:*** 73 yrs. ***Gender:*** 51% female **Mean BMI:** 24 kg/m^2 ; **Mean MUST score:** 2.4 ***Inclusion:*** hospitalisation, medium-high MUST score, >18yrs, resident to area near hospital. ***Exclusion:*** any of the following during hospitalisation: ONS; enteral/parenteral feed,	Weight, quality of life, mortality, length of hospital stay, Barthel index, patient satisfaction BMI, MUST

			enrichment provided after assessment, reassessed at 2 weeks, then based on improvement ***Duration:*** 6 months				chemo/ radiotherapy, malabsorption syndrome	
(Olsson et al., 1998)	Pre-post self-controlled	230	Nursing nutrition education, monitoring patients post education. ***Duration:*** 3 months	None	Hospital. Sweden	***HCP:*** Nurses ***Training:*** 4 month education. Trained in groups to identify at risk patients, calculate energy intake and requirements	***Diagnoses:*** Various ***Mean age:*** 73-74 yrs ***Gender:*** 53% female **Mean BMI:** 22-23 kg/m^2 ***Inclusion:*** at risk or undernourished on hospital admission ***Exclusion:*** *Not described*	Energy intake
(Lassen et al., 2004)	RCT	Pre: 48 Post: 60	Introduction and use of standard of nutritional care around collecting nutrition assessment data, screening, and estimating protein and energy intake. Monitoring of patient status	Usual care	Hospital (endocrinology and cardiology ward) Denmark	***HCP:*** Nurses ***Training:*** 4 meetings with nursing staff to introduce forms and how to use them. Weekly support from investigators	***Diagnoses:*** various ***Mean age:*** 72+/- 11 yrs. ***Gender:*** 64% female. **Mean BMI:** 24.7-26.6 kg/m^2 ***Inclusion:*** not on prescribed diet, no current or previous contact with dietitian, not ethnic minority,	Energy intake, protein intake, staff perceptions

			through forms. Re-assessment and monitoring based on nutritional risk **Other**: Kitchen introduced new diets during study ***Duration:*** 5 months				hospitalised minimum 5 days. ***Exclusion:*** dementia, severe mental/physical impairment.	
(Lassen et al., 2008)	Pre-post self controlled	Pre: 30 Post: 20 Partial I: 25	Specialist post created for nutritional health care assistants to provide nutrition care through ensuring nutritional and fluid needs are met to at nutritionally risk patients after assessment performed ***Duration:*** 6 months	Nutritional assessment and care plan by nurses	Hospital (lung, gastric and liver, endocrinology wards) Denmark	***HCP:*** Social and healthcare assistants ***Training:*** 1 month training to upgrade post to nutritional and healthcare assistants.	***Diagnoses:*** various ***Mean Age:*** 69-76 yrs. ***Gender:*** 56% female. **Weight loss over time (self reported):** 20-60% ***Inclusion:*** minimum 5 day hospitalisation, able to communicate, eat and drink normal diet. ***Exclusion:*** dementia, severe mental/physical impairment	Staff perceptions and patient satisfaction
(Lorefält et al., 2011)	NRCT	I: 42 C: 67	Staff education: Measure nutrition status and providing individualised meals based on nutritional risk status ***Duration:*** 3 months	Staff education on measuring nutrition status only	Residential Homes Sweden	***HCP:*** Nurses and nursing assistants ***Training:*** Education on MNA and individualising meals. One 2-3 hour session	***Mean age:*** 83-86 yrs. ***Gender:*** 65% female. **Mean BMI:** 25 kg/m^2 **Nutrition status (MNA):** 19% well nourished, 56% at-risk , 26% malnourished ***Exclusion:*** Parenteral/enteral feed and terminal stage.	Weight MNA, BMI Other: healthcare costs

(Pedersen et al., 2012)	Pre-post controlled	Pre: 90 Post: 88	Use of ESPEN nutrition guidelines including prescription of nutrition interventions and monitoring them. ***Duration:*** 11 months	Usual care	Hospital Denmark	***HCP:*** Nurses ***Training:*** Training on guidelines; 5 modules of 3-4 day duration, 6 hours a day. (144 hrs over 1 year)	***Diagnoses:*** Acute medical heart disease. ***Mean age:*** 57-60 yrs. ***Gender:*** 53% male pre, 67% male post. **Mean. BMI:** 25.6 kg/m^2; **Nutrition status (NRS-2002):** 87% no risk; 13% at nutritional risk ***Inclusion:*** admitted min 24hrs, understand Danish. ***Exclusion:*** pre-medication before surgery, invasive procedures, admitted to ICU.	Length of stay, patient perceptions BMI, nutrition risk
(Poulsen et al., 2007)	Pre-post controlled	I: 155 C: 190	Individual nursing plans: nutrition assessment, diet prescription, nutrition education based on risk status ***Duration:*** 13 months	Routine nutritional care	Geriatric rehabilitation clinic. Denmark	***HCP:*** Nurses ***Training:*** short class: 90 minute lecture individually or in small groups	***Diagnoses:*** various ***Mean age:*** 83.6 yrs ***Gender:*** 72% female. **Mean BMI:** 24 kg/m^2 ***Exclusion:*** < 8 days hospitalised, discharge to other clinic, died	Weight, Barthel index (BMI)
(Suominen et al., 2007)	Pre-post self-controlled	21	Individual dietary changes for patients ***Duration:*** 1 year	None/no control group	5 nursing homes including 1 dementia ward	***HCP:*** Nurses and food service personnel.	***Mean age:*** 85yrs ***Gender:*** 100% female **Nutritional status (MNA):** 0% non-	Energy intake, protein intake (BMI, MNA score)

					Finland(Hollingsworth et al., 2018)	***Training:*** Six 2-3hr training sessions over 6 months.	malnourished, 89% at risk, 11% malnourished	
(Wikby et al., 2009)	Pre-post controlled	I: 62 C: 53	Individual nutrition care ***Duration:*** 2 yr trial, 4 months per patient intervention	Usual care	8 residential homes. Sweden	***HCP:*** nurses and nursing assistants ***Training:*** Individualised nutrition programme. Half a day training 4x year.	***Mean age:*** 85 yrs ***Gender:*** 70% female. **Nutritional status (MNA**): n=24 well nourished, n=10 = at risk for malnutrition, n=8 malnourished ***Exclusion:*** terminal, malignant disease, kidney and liver disease	Weight index, MAMC, ADL (TSF, motor activity)
(Zhou, 2016)	Pre-post controlled	I: 34 C: 34	Nutrition counselling and nursing. ***Duration:*** 3 years	Routine nursing	Hospital China	***HCP:*** Nurses ***Training:*** no specialised training	***Diagnoses:*** patients on haemodialysis with end-stage renal disease ***Gender:*** 53% male ***Mean age:*** 52.7yrs **Mean BMI:** 23.6 kg/m^2; **Mean malnutrition inflammation score:** 5.2 ***Exclusion:*** important organ failure, mental illness	Quality of life, patient satisfaction BMI, Malnutrition inflammation score
				Multi-factorial				
(Palvanen et al., 2014)	RCT	I: 661 C: 653	Chaos falls clinic – falls prevention programme. In addition to multifactorial	General injury prevention brochure	Clinic Finland	***HCP:*** nurse, physiotherapist physician	***Diagnoses:*** Hypertension, CVD, osteoarthritis ***Mean Age:*** 78 yrs	BMI, falls, fallers, fall induced

			intervention such as medical and home hazard assessment, nutrition guidance on healthy diet with adequate Ca and Vit D ***Duration:*** 12 months			***Training:*** no specific training	***Gender:*** 86% female; **Mean BMI:** 27 kg/m^2 ***Inclusion:*** >70yrs, increased risk of falls or fall-induced injury. ***Exclusion:*** unable to give informed consent, disabilities/illness preventing physical activity and training, inability to move, terminal illness	injuries, fractures
(Holst et al., 2017)	Pre-post controlled	Pre: 30 Post: 37	Changes to food environment welcome tray with written materials about food & nutrition, welcome interview identifying nutritional preferences and challenges, nurses education on meal assistance, serving, and portion sizes, improved menu and meal presentation ***Duration:*** 3 months	Standard care	Hospital Denmark	***HCP:*** nursing staff, kitchen staff (hostesses) ***Training:*** by nutrition support team as part of intervention.	***Mean age:*** 63-67 yrs ***Gender:*** 53% male; **Mean BMI:** 26 kg/m^2 ***Inclusion:*** hospitalised on or >3 days, nutrition risk, registration of nutrient intake for 3 consecutive days. ***Exclusion:*** dementia, terminally ill, < 18 yrs.	Energy intake, protein intake BMI
(Chen et al., 2019)	RCT	I: 197 C: 180	mHELP protocol – early mobilisation, oral and nutritional assistance, orienting	Usual care	Hospital Taiwan	***HCP:*** nurses ***Training:*** unclear	***Diagnoses (surgery type):*** colorectal (56.5%), gastric (21.2%), pancreatobiliary (13.8%)	Weight, MNA, frailty rate

	communication Daily procedures ~ 30 minutes per session ***Duration:*** 3 yrs	***Mean age:*** 74.5yrs ***Gender:*** 56.8% male; **Nutritional status (mean MNA score):** 24.7 ***Inclusion:*** scheduled for GI surgery, expected hospital stay > 6 days.

ADL: Activities of daily living; BMI: Body mass index; C: Control group; CVD: Cardiovascular disease; EdFED: Edinburgh feeding evaluation in dementia; GI: Gastro-intestinal; HCP: Health care professionals; I: Intervention group; ICU: Intensive care unit; MAC: Mid-arm circumference; MAMC: Mid-arm muscle circumference; MNA: Mini nutritional assessment; MUST: Malnutrition universal screening tool; ONS: Oral nutritional supplements; RCT: Randomised control trial; TSF: Triceps skin fold.

4.1.3.2 Descriptions of HCP delivered interventions

4.1.3.2.1 Feeding Assistance Interventions

Five of 18 (28%) studies involved interventions of feeding assistance (n=956 participants).

Descriptions of feeding assistance interventions varied across studies with the most common features including preparation of patient and mealtime environment, and providing assistance and encouragement with eating (Chen et al., 2016) (Chang & Lin, 2005) (Young et al., 2013) (Hickson et al., 2004). This included mealtime environmental preparation, feeding skills specifically around food refusal, and interactions between the carers and patients. One study intervention delivered between between-meal supplements and/or snack delivery twice per day on weekdays (Hollingsworth et al., 2018). Four studies delivered feeding assistance by nurses or nursing assistants (Chang & Lin, 2005; Chen et al., 2016; Hollingsworth et al., 2018) (Young et al., 2013) and one was delivered by healthcare assistants in the hospital (Hickson et al., 2004). Four studies trained HCPs on feeding assistance with training lasting 4, 8 and 15 hours where specified (Chang & Lin, 2005; Chen et al., 2016; Hollingsworth et al., 2018; Young et al., 2013).

4.1.3.2.2 Nutritional Care Plan Interventions

Ten (56%) studies involved nutritional care plan interventions (n=1342 participants). Nutritional care plan interventions varied among the studies with a combination of more than one nutritional care procedure. Nine of ten (90%) interventions involved individualised nutrition assessment as a starting point of the nutrition care plan and for the monitoring and recording of intake and nutritional status, these involved: assessing nutrition requirements, dietary intake, difficulties meeting requirements

and/or documentation (Casals et al., 2015; Lassen et al., 2008; Lassen et al., 2004; Lorefält et al., 2011; Pedersen et al., 2012; Poulsen et al., 2007; Suominen et al., 2007; Wikby et al., 2009; Zhou, 2016). Six studies involved dietary changes such as provision of individualised meals, between meal snacks or supplements and fortified diets (Casals et al., 2015; Lassen et al., 2008; Lorefält et al., 2011; Poulsen et al., 2007; Suominen et al., 2007; Wikby et al., 2009), and three studies involved nutrition education and counselling (Casals et al., 2015; Poulsen et al., 2007; Zhou, 2016). Nine of these studies involved nurses or nursing assistants delivering interventions, with one study including food service personnel (Suominen et al., 2007). Training was provided in eight of 10 (80%) studies and varied from a one-off 3-hour session (Lorefält et al., 2011) to 144 hours over one year (Pedersen et al., 2012) through either individualised or group education sessions.

4.1.3.2.3 Multi-factorial Interventions

Three studies (17%) were multi-factorial interventions (n=1758 participants). One study provided nutrition advice alongside physical activity and exercise, strength and balance training, medication review, and home hazard modification within a falls prevention clinic by a multidisciplinary team of a nurse, physiotherapist and general practitioner (16). The second multi-factorial intervention involved implementation of a daily protocol for nurses to follow involving early hospital mobilisation, oral and nutritional assistance and orienting communication (Chen et al., 2019). The third multifactorial intervention involved nursing and kitchen staff implementing environmental changes, offering patients a welcome interview, and improvements to menu and meal presentation (Holst et al., 2017). Training was provided by a nutrition support team reported within this study only.

4.1.3.3 Study Quality and Risk of Bias

Among the 18 studies included, six were RCTs, one was a non-RCT, and 11 were pre-post trials of which six included a control group. In four studies, the primary aim was to evaluate a training programme, and patient outcomes were secondary measures. In these studies, risk of bias has been assessed against the outcomes of interest of this review (Chang & Lin, 2005; Olsson et al., 1998; Pedersen et al., 2012; Suominen et al., 2007). Unclear risk of bias was identified where insufficient information was provided. The risk of bias assessment is shown in **Figure 4.2**.

Of the RCTs, three reported a low risk of allocation concealment and random sequence generation (Chen et al., 2019; Hickson et al., 2004; Palvanen et al., 2014), while insufficient information from the remaining RCTs led to unclear risk. High or unclear risk of performance bias was identified where HCPs were inevitably aware of their intervention or insufficient information on blinding was provided. Selective reporting bias was high in one RCT due to discrepancies between outcomes reported in the study and the protocol (Lassen et al., 2004). The remaining studies did not register a protocol resulting in unknown risk. Among the other study designs most were either at high or unclear risk of confounding, selection and performance bias due to the lack of appropriate controls and sampling (e.g. matching different participants pre-post interventions) or insufficient information. Unclear reporting bias was due to missing protocol. Attrition bias was mostly unclear due to lack of information. Most studies were at high or unclear risk of detection bias due to use of subjective measurements or insufficient information. Among the two mixed methods study designs (Holst et al., 2017; Lassen et al., 2004), low risk of bias was found for the two domains addressing the appropriate use of the qualitative methods and study design. Most of the remaining domains were of unclear bias due to insufficient information. One study did not report

a clear statement of findings for the qualitative outcomes and was judged as high risk of bias for this domain (Holst et al., 2017).

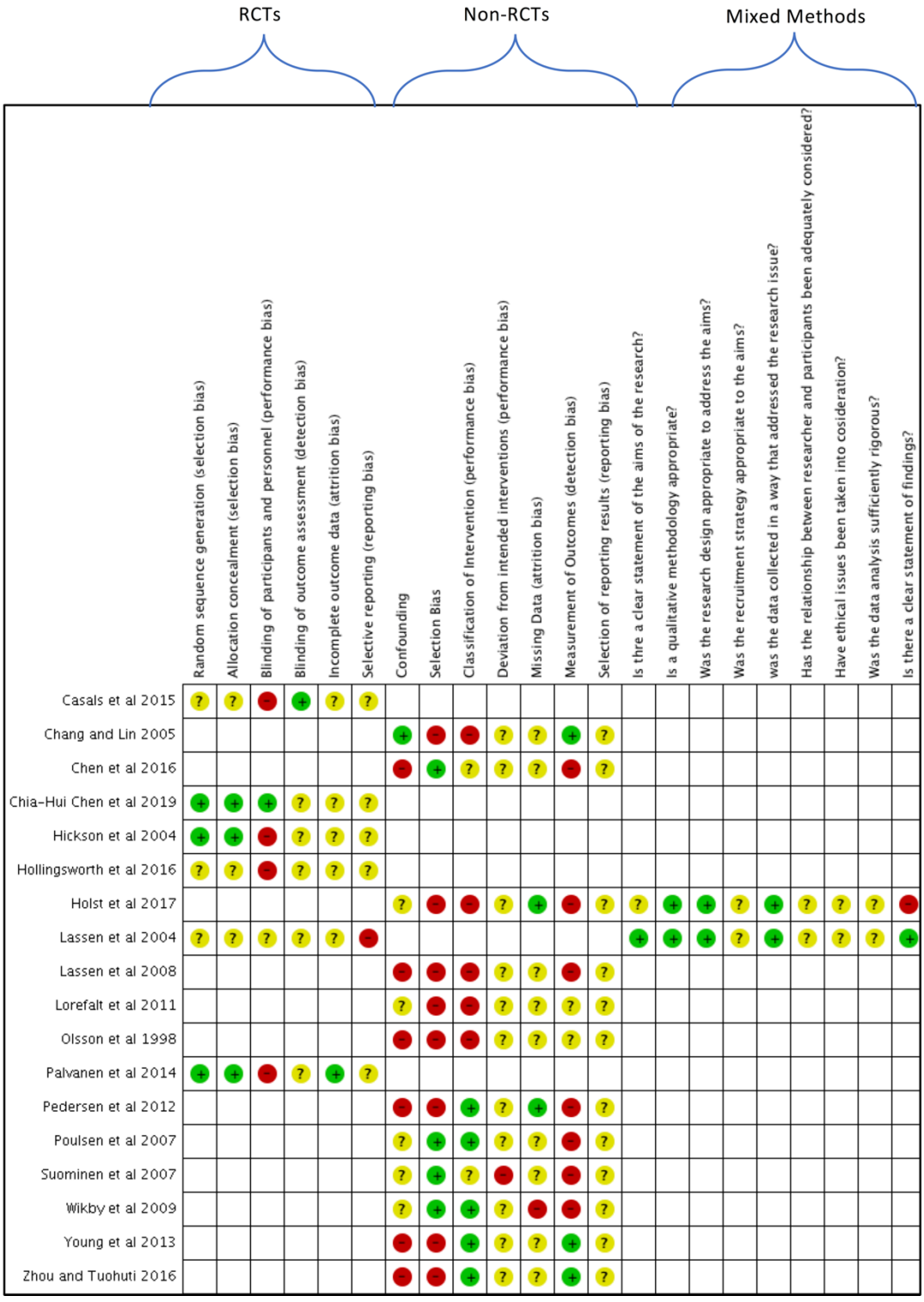


Figure 4.2. Risk of bias summary table: Review authors' judgement of quality for each included study. Key: - low risk; ? unclear risk; + high risk (Review Manager v5.3)

4.1.3.4 Effectiveness of HCP delivered interventions on primary and secondary outcomes

4.1.3.4.1 Feeding Assistance Interventions

Nutritional Status

Two of the feeding assistance studies reported on at least one outcome of nutritional status. One out of the five (20%) feeding assistance studies (n=592 participants) delivered by nurses in the hospital setting (Hickson et al., 2004) found no significant improvements for median (IQR) measurements of weight, BMI, MAMC, MAC, or triceps skinfold thickness between the intervention and control group (**Table 4.3**) (very low quality evidence). Significant changes in median (IQR) triceps skinfold thickness and upper arm circumference were highlighted in a pre-post nurse-delivered feeding assistance intervention, however this study had no control group (Chen et al., 2016).

Nutritional Intake

All five (100%) of the feeding assistance studies (n=1030 participants) reported on at least one outcome of nutritional intake (energy, protein, or food intake) with mixed results (**Table 4.4**). Measurement methods varied between the studies. Four studies estimated food intake through food portions using the fraction system across daily meals (Chang & Lin, 2005; Chen et al., 2016; Hickson et al., 2004; Young et al., 2013) and one study aimed at measuring between-meal snack intake, measured calories per snack episode consumed and calculated calories based on the snack or supplement serving information (2 snacks per day) (Hollingsworth et al., 2018). Significant improvements were highlighted in two interventions (very low quality evidence) delivered by nurses and nursing assistants (Chen et al., 2016; Hollingsworth et al., 2018). In the RCT by Hollingsworth et al., 2016, a significantly higher energy intake

in the intervention group involving non-HCPs compared to HCPs was noted (Hollingsworth et al., 2018). No significant improvements in energy intake were reported in the remaining studies (Hickson et al., 2004; Young et al., 2013), however one study (Young et al., 2013) reported significant improvements in the percentage of patients reaching energy requirements after the intervention. No improvements in protein intake was found in the study reporting this outcome (very low quality evidence) (Young et al., 2013). Food intake measured through portions did not differ between the intervention and control group after a nursing assistant delivered feeding assistance in an RCT conducted in a long-term care setting (very low quality evidence) (Chang & Lin, 2005).

Table 4.3: Summary of data for studies reporting the nutritional status outcomes weight, BMI, nutritional risk score and MAMC

Nutrition Status Outcome	Study ID	Intervention (HCP type)	Total sample size	Results[a]		
				Intervention (SD)	Control (SD)	P value
Feeding Assistance[b]						
Weight (Kg)	(Hickson et al., 2004)	Feeding support and care plan (HCAs)	592	-0.3(-0.9-0.3)	-0.1 (-0.9-0.4)	0.23
BMI (kg/m^2)	(Hickson et al., 2004)	Feeding support and care plan (HCAs)	592	-0.7(-2.5-0.8)	-0.3(-2.8-1)	0.68
MAMC (cm)	(Hickson et al., 2004)	Feeding support and care plan (HCAs)	592	-0.1 (-0.8-0.4)	-0.1(-0.5-0.3)	0.84
Nutritional Care Plans						
Weight (Kg)	(Casals et al., 2015)	Nutrition counselling (nurses)	93	+4.75 (5.12)	-0.903 (6.12)	<0.001
	(Lorefält et al., 2011)	Individualised meals (nurses, NAs)	109	+2.7(3.9)	-0.6(4.9)	<0.001
	(Poulsen et al., 2007)	Individualised nursing plans (nurses)	345	0 (2.9)	-0.1 (2.8)	0.89
BMI (kg/m^2)	(Casals et al., 2015)	Nutrition counselling (nurses)	93	1.745(2.06)	-0.395 (2.43)	<0.001

	(Lorefält et al., 2011)	Individualised meals (nurses, NAs)	109	25.6(4.9)	23.7(4.9)	0.05
	(Suominen et al., 2007)	Individualised diet changes (nurses and food service)	21	Pre:21.7 Post: 21.4	no control	n/a
	(Zhou, 2016)	Nutrition counselling(nurses)	68	23.6 (3.4)	17.5 (2.3)	p<0.05
Nutritional risk score	(Casals et al., 2015)[c]	Nutrition counselling (nurses)	93	-2.457(1.39)	-1.170 (1.67)	<0.001
	(Lorefält et al., 2011)[d]	Individualised meals (nurses, NAs)	109	9 (21.4); 28 (66.7)5; (11.9)	3 (4.5) 45 (67.2) 19 (28.4)	0.01
	(Suominen et al., 2007)[e]	Individualised diet changes (nurses and food service)	21	Pre: 0(0), 17(89), 2(11) Post: 3(16), 12(63), 4(21)	No control	0.10
	(Zhou, 2016)[f]	Nutrition counselling(nurses)[e]	68	5.2(0.3)	8.7(0.5)	p<0.05
MAMC (cm)	(Wikby et al., 2009)	Individualised nutrition (nurse and NAs)	115	23.6(2.8)	22.9(2.3)	0.156
		Multi-factorial				
Weight (Kg)	(Chen et al., 2019)	Multi-factorial. Nutrition assistance included. (nurses)	363	-0.95(2.5)	-1.81(2.59)	0.002
BMI	(Holst et al., 2017)	Multi-factorial. Environment changes (nurses, kitchen staff)	67	Baseline: 26.9(4) Fup: 23.0(6.3)	No control	0.14
Nutritional risk score	(Chen et al., 2019)[e]	Multi-factorial. Nutrition assistance included. (nurses)	363	-3.2(3.4)	-4.0(3.4)	0.03

HCA: health care assistant; HCP: healthcare professional; MAMC: mid-arm muscle circumference; NA: nursing assistant; n/a: not applicable (not reported); SD: standard deviation.

[a] +/- before results value indicates positive or negative mean change within group, p-value significant between I and C groups or pre-post intervention where indicated, significant at p<0.05

[b] values reported as median(IQR)

[c] measured by MUST screening tool

[d] values correspond to: well nourished, at risk, malnourished measured by MNA screening tool

[e] measured by MNA screening tool

[f] measured using malnutrition inflammation screening tool

Table 4.4: Summary of data for studies reporting energy and protein intake.

Nutrition intake outcome	Study ID	Intervention (HCP type)	Total sample size	Results[a]		
				Intervention (SD)	Control (SD)	P value[b]
Feeding Assistance						
Energy Intake (Kcal/day)	(Chen et al., 2016)[c]	Feeding assistance (nurses)	30	Pre: 1400 (1000-2000) Post: 2000 (1400-2000)	No control	<0.001
(Kcal/per snack offered)	(Hollingsworth et al., 2018)	Feeding assistance at between meal-supplements and/or snack delivery (NAs)	127	+77(94)	+130 (126)	<0.01
(KJ/day)	(Hickson et al., 2004)	Feeding support and care plan (HCAs)	592	5780	5410	0.53
(KJ/day)	(Young et al., 2013)	PM AIN PM + AIN (MDT, NAs)	245	Pre intervention: 5011 (1774) PM: 4957 (2237) AIN: 5574 (1965) AIN+PM 5618 (2540)	No control	0.16
% reaching EER	(Young et al., 2013)	PM AIN PM + AIN (MDT, NAs)	254	Pre intervention: 8% PM: 20% AIN: 21% PM+AIN:31 %	No control	< 0.01
Protein (g/day)	(Hickson et al., 2004)	Feeding support and care plan (HCAs)	592	50	47	0.62
	(Young et al., 2013)	PM AIN PM + AIN (MDT, NAs)	254	Pre intervention: 47 (19) PM: 43 (21) AIN: 53 (19) PM+AIN: 51 (22)	No control	0.07
Nutritional Care Plans						
Energy Intake (Kcal/day)	(Olsson et al., 1998)	Nutrition nursing, monitoring patients	230	Pre: 1519 (355.2) Post: 1646 (427.21)	No control	n/a
(KJ/day)	(Lassen et al., 2004)	Nutrition assessment and	108	Ia: + 1,061 Ib: -700	Ca: -2,166	n/a

		management (nurses)			Cb: -1,127	
(Kcal/day)	(Suominen et al., 2007)	Individualised diet changes (nurses and food service)	21	Pre: 1230 Post: 1487	No control	<0.001
% reaching EER	(Lassen et al., 2004)	Nutrition assessment and management (nurses)	108	Ia: 26 Ib: -9	Ca: -18 Cb: -9	Ia 0.01 to Ca and Cb
95% + of EER	(Olsson et al., 1998)	Nutrition nursing, monitoring pts	230	Pre: 15(13%) Post: 26(23%)	No control	n/a
Protein (g/day)	(Lassen et al., 2004)	Nutrition assessment and management (nurses)	108	Ia: +5 Ib: -10	Ca: -19 Cb: -6	n/a
	(Suominen et al., 2007)	Individualised diet changes (nurses and food service)	21	Pre: 50.4 Post: 60.9	No control	0.006
% reaching PR	(Lassen et al., 2004)	Nutrition assessment and management (nurses)	108	Ia: +12 Ib: -16	Ca: -13 Cb: -9	Ia 0.009 to Ca and Cb
		Multi-factorial				
Energy Intake (Kcal/day)	(Holst et al., 2017)	Multi-factorial. Environment changes (nurses, kitchen staff)	67	Baseline: 1528 (648) Fup: 1553 (524)	No control	0.862
Protein Intake (g/day)	(Holst et al., 2017)	Multi-factorial. Environment changes (nurses, kitchen staff)	67	Baseline: 58 (26) Fup: 53 (19)	No control	0.469
% reaching >75% EER	(Holst et al., 2017)	Multi-factorial. Environment changes (nurses, kitchen staff)	67	Baseline: 40 Fup: 67.6	No control	0.0367
% reaching >75% PR	(Holst et al., 2017)	Multi-factorial. Environment changes (nurses, kitchen staff)	67	Baseline: 33.3 Fup: 37.8	No control	0.703

AIN: additional feeding assistant; C: control; Ca: Control group a; Cb: control group b; EER: Estimated Energy Requirements; HCA: health care assistant; HCP: healthcare professional; I: intervention; Ia: intervention group a; Ib: intervention group b; MDT: multi-disciplinary team; NA: nursing assistant; n/a: not applicable (not reported); PM: Protected mealtimes; PR: protein requirements; SD: standard deviation.

a +/- before results value indicates positive or negative mean change within group. Remaining values indicate final measures only with no baseline to calculate change.

b p-value between intervention and control group or between pre and post interventions where indicated, significant at $p<0.05$

c values reported as median (IQR)

Activities of Daily Living

One (20%) feeding assistance intervention reported (n=509 participants) on Activities of Daily Living (ADLs) using validated measurement tools and found no difference in ADL scores between groups after the feeding assistance intervention within a long-term care setting (low quality evidence) (Hickson et al., 2004).

Handgrip Strength

One (20%) RCT of feeding assistance (n=509 participants) measured handgrip strength (HGS) with no difference found between the treatment and control groups (very low quality evidence) (Hickson et al., 2004).

Mortality

One (20%) feeding assistance intervention (n=509 participants) reported on mortality with no significant differences between intervention and control groups (low quality evidence) (Hickson et al., 2004).

Length of hospital stay

One (20%) feeding assistance study reported on length of hospital stay (LOS) (n=509 participants), with no significant differences reported between groups (very low quality evidence) (Hickson et al., 2004).

Patient and staff perception

One (20%) study (n=36 participants) reported on the knowledge, attitude and behaviour of HCPs in a feeding assistance study using questionnaires and a checklist and found significant improvements in these outcomes after HCP training (Chang & Lin, 2005) **(Table 4.5)**.

Table 4.5: Summary of patient and staff perceptions of intervention.

Study ID	Sample size and method of data collection	Reported outcomes
	Feeding Assistance	
(Chang & Lin, 2005)	67 NAs. The Formal Caregiver's Knowledge of Feeding Dementia Patients Questionnaire. The Formal Caregiver's Attitude toward Feeding Dementia Patients Questionnaire. The Formal Caregiver's Behaviours toward Feeding Dementia Patients Observation Checklist.	***HCP knowledge, attitude and behaviour*** • After training, NAs had more knowledge than control ($p<0.001$) • Intervention HCPs had higher positive attitude scores ($p<0.001$) • Intervention HCPs had better behaviour scores ($p<0.001$)
	Nutrition Care plans	
(Lassen et al., 2004)	26 members of staff Focus group interviews using interview guide for each occupational group.	***Staff perceptions*** Divergent attitudes: • Staff in intervention did not use nutritional records systematically. Nurses felt they were too comprehensive and overwhelming. • Decision to take part in study was by central management, not by staff. • Head nurse in Ia found intervention useful while in Ib staff did not show much commitment. Lack of flexibility: • Individual nutrition not easily introduced due to tight meal schedule and insufficient time outside of mealtimes. Lack of knowledge: • Due to large staff turnover (9% during 7 months including intervention in Ia and 46% in Ib) • Staff felt dietitians were too busy to be consulted while dietitians felt they wanted to offer support. Attitude: • Nutrition reported as often ignored due to lack of time. Head nurse and staff in Ia felt nutrition care was secondary while head nurse in Ib felt it should be a priority. Recognition of responsibility: • Different occupational groups had different priorities. • Lack of accountability for practical parts of nutrition care

		with involvement of various staff groups.
(Lassen et al., 2008)	Structured Interviews: Patient Questionnaire Focus Group Staff Interviews Cost: Total monthly food supply and daily food supply per patient Visual assessment of food wastage	**Patient Perceptions:** • More patients in group with NHCA felt staff tried to ensure improved nutritional intake. • Patients with NHCA felt other staff didn't place enough importance on nutrition care and didn't seem to care -especially night staff. **Staff Perceptions:** • NHCAs found nutritional care the easier task but struggled to build acceptance among colleagues and establish cooperation. • Nursing staff found that NHCAs look after nutritional care of weakest patients which allows nurses to have more time for other nursing tasks. • Nursing staff often give nutrition a low priority due to lack of time and interest. • NHCA felt senior staff role is important for supporting acceptance of NHCA role. • Staff mostly appreciate qualification and knowledge of NHCA. • Some nurses 'show no appreciation of importance of nutrition for the care and treatment of patients. **Cost:** • Food supply expenses decreased by an average of 20% during intervention compared to control period. • Food wastage was reduced by about 2/3 during intervention.
(Suominen et al., 2007)	Feedback questionnaire	**Staff Perceptions:** • Easier to support patient's nutrition and more motivated after education. • Lack of time was an important issue.
	Multi-factorial	
(Holst et al., 2017)	Semi-structured staff and patient interviews (assess satisfaction). Staff and patient questionnaires (quality of intervention).	**Patient Perceptions:** • "company increases appetite" • "food was served nicely, in portions precisely suited to me"

	• Positive comments from patients on nurses' interest in individual preferences for food. • Patients felt their needs were met well in intervention. **Staff Perceptions:** • Nurses had positive opinions about intervention task.

HCP: healthcare professional; I: intervention; Ia: intervention group a; Ib: intervention group b; NA: nursing assistant; NHCA: Nutritional and health care assistant

4.1.3.4.2 Nutritional Care Plan Interventions

Nutritional Status

Six out of ten (60%) studies of nutritional care plan interventions reported on at least one measure of nutritional status as an outcome (n=751 participants). There was a significant improvement in mean weight changes between the intervention and control groups among two studies (Casals et al., 2015; Lorefält et al., 2011) (very low quality evidence) and between intervention and control groups for BMI (Casals et al., 2015; Zhou, 2016) (very low quality evidence). In one pre-post nutrition care plan intervention within a rehabilitation clinic, no changes in BMI were observed among the undernourished BMI group, numbers were not recorded (Poulsen et al., 2007). No significant differences in MAMC between groups were observed (very low quality evidence) (Wikby et al., 2009). The nutritional screening tools used for measurement varied among these studies (MUST, MNA, malnutrition inflammation tool; table 4.3). There were significant improvements in nutritional risk status between the intervention and control groups in three studies of nutritional care plan interventions (Casals et al., 2015; Lorefält et al., 2011; Zhou, 2016) (low quality evidence). One pre-post study design (Suominen et al., 2007) did not find any significant changes in the nutritional risk score. Two studies measured nutritional status at baseline, however

did not report the outcome effect after the intervention (Palvanen et al., 2014; Pedersen et al., 2012).

Nutritional Intake

Four (40%) nutrition care plan studies evaluated nutritional intake (n=537 participants), however two studies did not report on significance between groups (Lassen et al., 2004; Olsson et al., 1998) (table 4.4). One study providing individualised meal changes by nurses and food service personnel reported a significant difference in energy intake before and after the intervention (no control group) (Suominen et al., 2007) (very low quality evidence). In the study by Lassen *et al.*, (2004), there were two intervention (Ia and Ib) and two control groups. Intervention group Ia experienced significant improvements in the percentage of people reaching their energy and protein requirements, and non-significant improvements in energy intake compared to control, but not Ib (Lassen et al., 2004) (very low quality evidence). One nutritional care plan intervention, which used different participants during intervention years, reported a significantly higher percentage of participants self-reporting consuming daily snacks in the afternoon (33%; 67%, $p<0.001$), evening (33% vs 56%, $p=0.004$), and between meals (19% vs 81%, $p=0.014$) after the intervention (Pedersen et al., 2012) (very low quality evidence). Similar to the feeding intervention studies, measurement methods varied among studies.

Activities of Daily Living

Three (30%) nutrition care plan interventions reported on ADLs using validated measurement tools (n=553 participants). One hospital based nutrition care intervention (Casals et al., 2015) reported a significant improvement in the ADL

scores among the intervention receiving nutritional counselling as compared to the control group (mean difference: 7.49; p = 0.025) (low quality evidence). There were no differences in the two pre-post studies reporting this outcome after the nutritional care intervention (Poulsen et al., 2007; Wikby et al., 2009).

Mortality

One (10%) nutritional care plan intervention (Casals et al., 2015) reported on mortality (n=93 participants) with no significant differences between intervention and control groups (low quality evidence).

Quality of Life

Two of ten (20%) nutrition care plan interventions reported quality of life outcomes using validated tools (n=161 participants) (Casals et al., 2015; Zhou, 2016). One hospital based RCT reported a significantly higher mean change in overall, physical and mental scores for the intervention group as compared to the control group (+15.51(15.07) vs +1.79(12.86); 14.66(15.99) vs (2.68(11.86)); 16.37(15.71) vs 0.91 (14.23), p<0.001, respectively) (Casals et al., 2015). The second study reported a significantly higher score improvement after the nursing care intervention between the observation and control group (71.2(4.5) vs 59.8(4.7), p <0.05) (very low quality evidence) (Zhou, 2016).

Length of hospital stay

Two (20%) nutritional care intervention study studies reported on length of stay (LOS) (n=286 participants). One nurse delivered hospital based study reported a significantly reduced LOS by 3.5 days after the nutrition care plan intervention (p = 0.049) (Pedersen et al., 2012), and no difference was reported in the remaining study (Lassen et al., 2004) (very low quality evidence).

Healthcare Cost

One (10%) nutritional care plan study (n=109 participants) reported on the healthcare cost measured as the direct costs for primary or hospital care based on each patient contact with the health service and was calculated the year after the intervention (Lorefält et al., 2011). This non-RCT within a long-term care setting, reported the results as medians between the groups, total cost was 1005 euros in the intervention group and vs 921 euros in the control group, primary health care median cost was 790 euros in the intervention group and 487 in the control group. Hospital healthcare median cost was 0 in the intervention group and 98 euros in the control groups. However, this was not a formal cost-effective analysis and significance was not reported (very low quality evidence).

Patient and staff satisfaction

Two nutritional care plan studies (20%), reported patient satisfaction with the intervention (n=161 participants). One was an RCT using a validated tool (CSQ-8) (Casals et al., 2015) and the other control-led pre-post intervention used a self-designed questionnaire (Zhou, 2016). Both studies reported significantly higher satisfaction with the intervention compared to the control group, (4.34 CSQ-8 points ($p<0.01$) and 12% improvement ($p<0.05$), respectively ($p<0.05$) (very low quality evidence).

Patient and staff perception

Three (30%) nutritional care plan studies (n=204 participants) reported qualitative data on patient and staff perceptions of the intervention displayed in table 4.5 (Lassen et al., 2008; Lassen et al., 2004; Suominen et al., 2007). Methods for collecting data varied across studies ranging from the use of questionnaires, semi-structured

interviews and focus groups. Among the nutritional care interventions, patient perceptions were generally positive and a theme emerged around challenges for HCPs to implement interventions, particularly in relation to attitude towards importance of nutrition and available time to carry out nutritional care (table 4.5).

4.1.3.4.3 Multifactorial Interventions

Nutritional Status

Two of the three multifactorial studies (67%) reported on at least one outcome of nutritional status (n=430 participants). One multifactorial intervention delivered by nurses demonstrated significant improvement in mean weight change (very low quality evidence) and nutritional risk score (low quality evidence) between the intervention and control groups (Chen et al., 2019) (table 4.3). The second multifactorial intervention study which did not have a control group, did not find any significant changes in BMI (Holst et al., 2017).

Nutritional Intake

One (33%) multifactorial intervention (n=67 participants) reported on nutritional intake and found no significant improvements in energy or protein intake before and after the intervention which included meal environment changes (Holst et al., 2017) (very low quality evidence). However, a significant difference in the percentage of patients reaching energy requirements before and after the intervention was observed only (table 4.3) (very low quality evidence). In this multifactorial intervention, different study populations were included for comparison during the pre and post intervention periods.

Falls and frailty rate

Falls rate measured in one multifactorial RCT (33%), which included nutritional advice on healthy eating and calcium and vitamin D supplementation within a falls (chaos) clinic, demonstrated a significantly lower falls rate (IRR: 0.72 (95% confidence interval (CI) 0.61–0.86, p < 0.001, NNT 3), number of fallers (HR: 0.78(95% confidence interval (CI) 0.67–0.91), p=0.001, NNT6) , and falls induced injuries (IRR: 0.74 (95% CI 0.61–0.89), p = 0.002, NNT 5), but not fractures (IRR: 0.77 (95% CI, 0.48–1.23; p = .276) within the intervention group compared to the control group after one year (low quality evidence; n=1314 participants) (Palvanen et al., 2014). Frailty rate was measured based on validated criteria in the second multifactorial RCT (33%) within the hospital setting (n=377 participants) (Chen et al., 2019). Significantly lower rates of incident (RR: 0.55(95%CI 0.33-0.93), p=.,02, NNT=1) and persistent (0.54 (95% CI 0.30-0.97), p=.03) frailty were measured within the intervention (mHELP) group compared the control group in this study (low quality evidence) (Chen et al., 2019).

Patient and staff perception

One (33%) multifactorial study (Holst et al., 2017) reported on patient and staff perceptions of the intervention displayed in table 4.5 (n=67 participants), with positive outcomes reported from patients and staff measured by semi-structured interviews and questionnaires.

4.1.4 Discussion

This is the first review to document and characterize the range of nutritional interventions provided by non-dietetic HCPs for the management of malnutrition and to collate evidence on their effectiveness. Nurses made up the largest group of

healthcare professionals delivering interventions. Interventions identified were grouped into three categories, feeding assistance, nutritional care plan and multifactorial interventions. Over half (56%) of the studies were nutritional care plan interventions and feeding assistance always involved training prior to the intervention. Interventions took place in a mixture of healthcare and long-term care settings but not in participants' own homes. Results were often inconsistent with no clear trends identified in the data for any outcomes and quality of evidence ranged from low quality to very low quality evidence for the different outcomes (**Table 4.6**).

Table 4.6: Summary of findings for quality of evidence of main outcomes based on GRADE

Population**: Malnourished adults or at risk of malnutrition; non-dietetic HCPs**
Setting: **Hospital (n = 9), community (n = 8), Mixed (n = 1)**
Intervention: **Non-dietetic HCP delivered nutritional interventions: Feeding Assistance (n = 5), nutritional care (n = 10), Multi-factorial (n = 3)**
Comparison: **usual care, or pre-intervention.**

Outcome	Number of participants (studies)	Effect	Quality of evidence (GRADE)
Nutritional Status			
Weight	1,502 (5)	Three studies showed improvement ranging from 0.86Kg to 5.65Kg and two showed no difference.	⊕○○○ Very low[1,2,3]
MAMC	624 (2)	All studies report no change.	⊕○○○ Very low[1,2,3]
BMI	920 (6)	Two studies reported improvement ranging from 1.35 to 6 kg/m^2. Two studies showed no improvement. One study did not report significance. One study did not report values.	⊕○○○ Very low[1,2,3,4]
Nutrition Risk Score	654 (5)	Four studies reported significant improvements. One study showed no difference.	⊕⊕○○ Low[1,4]
Nutritional Intake			
Energy Intake	1,420 (8)	Three studies showed improvement ranging from 77Kcal/day to 600Kcal/day and five studies found no difference.	⊕○○○ Very low[1,2,3,4]
% reaching estimated	650 (4)	All interventions showed improvement. 3 studies reported	⊕○○○ Very low[1,2,4]

energy requirements		improvement ranging from 12-28%. 1 study showed improvement of 44% in one intervention group and no difference in the other.	
Protein Intake	1,033 (5)	Three studies showed no difference. One study found significantly higher intake of 10g/day in intervention and another reported increased intake with mean difference of 24g/day in one intervention group and no difference in the other.	⊕○○○ Very low[1,2,4]
% reaching estimated protein intake	175 (2)	One study showed no difference, and one study showed no difference in one intervention group and a significant improvement of 25% in another intervention group.	⊕○○○ Very low[1,2]
Snack/Food Intake	214 (2)	One study showed no difference, one study showed increased intake in snacks at different time periods ranging from 56-81%.	⊕○○○ Very low[1,3,4]
Functional			
Activities of Daily Living	1,145 (4)	Three studies found no difference and 1 study showed a significant improvement of 7.49 (scale of 0-100).	⊕⊕○○ Low[1,2,3]
Handgrip Strength	592 (1)	One study showed no difference.	⊕○○○ Very low[1,3]
Falls rate	1314 (1)	One study showed significant improvement (IRR: 0.72)	⊕⊕○○ Low[1,3]
Falls related injuries	1314 (1)	One study showed significant improvement (IRR: 0.74)	⊕⊕○○ Low[1,3]
Fractures	1314 (1)	One study showed no improvement.	⊕⊕○○ Low[1,3]
Frailty rate	377 (1)	One study showed significant improvement (RR 0.55).	⊕⊕○○ Low[1,3]
Quality of Life	161 (2)	Both studies showed significant improvement.	⊕○○○ Very low[1,2]
Mortality	602 (2)	Both studies showed no difference.	⊕⊕○○ Low[1,2]
Length of Stay	878 (3)	Results are mixed. One study reported reduction of 3.5 days. One study showed reduction in one group but not the other and another study showed no difference.	⊕○○○ Very low[1,2]
Healthcare cost	109 (1)	Not estimable	⊕○○○ Very low[1,2,4]
Patient Satisfaction	150 (2)	Both studies showed significant improvement, one of 4.34 (scale of 8-32) and one of 12% (number of patients satisfied)	⊕○○○ Very low[1,2]

High Quality: High confidence that the estimated effect is similar to the true effect.
Moderate Quality: True effect is likely close to estimated effect; however further research is likely to impact on confidence.
Low Quality: The true effect may be markedly different to estimated effect; further research is very likely to have an impact on confidence.
Very Low Quality: The true estimate is likely to be markedly different to estimated effect; there is little to no confidence on the effect.
Reasons for downgrading quality of evidence:
1 – High or unclear risk of bias for several or important domains in majority of studies
2 – Imprecision of estimates due to narrative synthesis (unknown effect size and confidence intervals)
3 – Lack of generalizability due to variable characteristics of populations (gender imbalance, diagnosis, severity of malnutrition or risk) or intervention type
4 – Limitations in study design or methods (lack of control group or baseline measures, use of unvalidated tool)

HCP: health care professional; MAMC: mid-arm muscle circumference

4.1.4.1 Feeding Assistance Interventions

Previous systematic reviews explored the effectiveness of volunteers delivering mealtime assistance (Green et al., 2011; Howson et al., 2017; Latif et al., 2020) or reviewed these interventions among specific populations such as in older adults (Edwards et al., 2017) and patients with dementia (Abdelhamid et al., 2016), without focusing on HCP delivery. The most recent review by Latif et al., 2020 demonstrated evidence of the efficacy of volunteer delivered interventions in improving some outcomes such as lunchtime energy intake and patient experience and satisfaction, in nutritionally at-risk adults across healthcare settings, however these data were also derived from very low or low quality evidence (Latif et al., 2020). In our review, no feeding assistance interventions demonstrated improvements in weight or MAMC. While MAMC may be a more sensitive indicator of protein reserves in the body when compared to weight (Omran & Morley, 2000), the two studies reporting MAMC had interventions of short duration (16 days and 3 months, respectively) and small sample sizes, which may have influenced the ability to demonstrate benefits (Chen et al., 2016; Hickson et al., 2004). In addition factors such as a suppressed appetite due to illness or drug side effects may also contribute to the difficulties in achieving improvements in acutely ill older patients, such as (Hickson et al., 2004), emphasizing

the need to evaluate the varied underlying causes of malnutrition which may not be addressed through feeding assistance alone. Methods of assessing and reporting nutritional intake varied across studies making direct comparison difficult. One study reporting improvements in energy intake was conducted in a small sample of patients with Alzheimer's dementia and dysphagia, who may initially have required more assistance than other nutritionally vulnerable populations (Chen et al., 2016). In the second study, greater improvement in the trained non-HCP group delivering snacks compared to the nurses group suggests that nurses may not have fully adhered to the intervention as a result of their competing priorities, staff turnover and/or that staff training is needed (Hollingsworth et al., 2018). The review by Edwards et al., 2017 also highlighted similar barriers to mealtime assistance by qualified staff (Edwards et al., 2017).

4.1.4.2 Nutritional Care Plan Interventions

Improvements in weight, BMI and nutritional risk status (Casals et al., 2015; Lorefält et al., 2011) or QOL and ADL (Casals et al., 2015; Zhou, 2016) were reported where the nutritional care plan intervention was delivered based on the participant's nutritional risk status. Thus, underlining the importance of screening for the identification of at risk individuals and individualising nutritional care (NICE, 2017). This was also seen with one of the studies reporting improved energy intake, where the majority of included participants were at risk of malnutrition (Suominen et al., 2007). Barriers towards prioritising nutritional care by nurses were also highlighted. Although nurses have a much higher workforce number in the UK and across Europe than dietitians, they are also experiencing severe shortages (Buchan et al., 2019). Furthermore, while nutritional screening is recommended and can be performed by

other HCPs, studies have shown that identification, documentation and referrals remain sub-standard in the UK (Frank et al., 2015).

4.1.4.3 Multi-factorial Interventions

Multi-factorial interventions highlighted improvements in falls and frailty related outcomes, however types of outcomes reported varied among these studies. Palvanen et al., 2014 reported a greater reduction in falls among the intervention group, however this study did not measure other outcomes related to nutritional status (Palvanen et al., 2014). Among the important risk factors, loss of muscle mass, muscle strength and malnutrition also contribute to falls and functional decline (Kim et al., 2010; Moreland et al., 2004). Interestingly in the mHelp hospital-based study, reporting improvements in incidence and persistence of frailty, the frequency of the delivered intervention was daily oral and nutritional assistance, communication and mobilization (Chen et al., 2019). Due to the multi-factorial nature, it is not possible to determine if the nutritional aspects of the intervention or which HCP are responsible for change within these studies, however, these studies suggest the importance of multidisciplinary team integration in patient care. Similarly, in the review by Rasmussen et al., 2018, improved QOL was reported among the multidisciplinary team delivered nutrition support interventions (Rasmussen et al., 2018).

4.1.4.4 Clinical Implications

This review identified similar interventions to a previous review which reported on nutritional interventions delivered by nurses only. Similar to our review, they also identified mixed effects on outcome (Ten Cate et al., 2020). In contrast with the previous review our review also identified feeding assistance and included HCPs other than nurses, including non-dietetic multidisciplinary teams and healthcare assistants.

Given the position of HCPs in frequent contact with nutritionally at-risk populations such as older adults, involving other non-dietetic HCPs in nutritional care is an innovative approach for the management of malnutrition. Nutritional guidelines recommend HCP involvement within the nutritional care process through nutritional screening, integration of multidisciplinary teams into nutritional management and appropriate documentation and monitoring (NICE, 2017). However, training of non-specialist HCPs is key to overcome challenges. While none of the studies evaluated feasibility, exploration of staff perceptions in this review provided a positive indication on the acceptability of interventions by staff, specifically among nutritional care plan interventions. The underlying causes of malnutrition and baseline nutritional status of the participants should be considered when interpreting outcomes. A lack of consensus remains for both the standard diagnosis of malnutrition and gold standard screening tool for identification of malnutrition risk (Cederholm et al., 2017; Cederholm et al., 2015) as evident by the variety of nutritional screening tools used among the studies. Interventions were grouped into three main nutritional interventions to allow for exploration, however the varied interventions within the groups ranging from meal assistance, food encouragement, dietary changes, nutritional counseling to multifactorial interventions, as well as their duration (one-off versus longer duration interventions), make it difficult to (1) compare between interventions (2) determine which intervention component influences outcomes and (3) comment on the clinical significance of the results. Additionally, small sample sizes and baseline conditions of included participants varied widely (eg. kidney disease, surgical conditions or dysphagia), adding to the complexity of assessing effectiveness in these HCP-delivered interventions.

4.1.4.5 Strengths and Limitations

A comprehensive list of search terms was created by two authors working in collaboration aimed at capturing all relevant studies. Two authors completed study screening, data extraction and synthesis, risk of bias assessment and assessment of overall quality of the body of evidence using the GRADE framework. To minimize bias among authors a protocol was completed. The novelty of the present review added to the evidence pool by exploring a range of non-dietetics HCPs involved in delivering nutritional interventions, which has not yet been evaluated in previous reviews and characterized additional nutritional interventions. Limitations to consider include, a meta-analysis was not performed due to inconsistencies in interventions, data collection methods, and outcome reporting. Three studies may have been relevant to this review however were excluded as they were in German or Chinese and could not be translated for the purpose of this project. The inclusion of all study types may have contributed to the low-quality evidence in the present review. However, their inclusion aimed to capture a full range of interventions and literature especially where RCTs may not be possible (Benson & Hartz, 2000).

4.1.5 Conclusions

The very low- and low-quality evidence from the majority of studies with high or unclear risk of bias makes it challenging to provide conclusive recommendations on the efficacy of non-dietetic HCP interventions in managing malnutrition. However, this review does highlight the potential benefits of these interventions based on evidence among older populations and the various ways in which HCPs in key contact with nutritionally at-risk patients can provide support and help decrease the dietetic burden. Additionally, it is difficult to make conclusions on which interventions are effective in targeting nutritional risk due to the heterogeneity of these intervention

types. This review also highlights barriers to intervention implementation, thus further research is needed to evaluate the feasibility, adherence and cost effectiveness of these interventions in order to appropriately target resources towards malnutrition management, which may differ across healthcare settings. None of the studies included in this review were conducted at home in the community setting. While the majority of the malnourished population, specifically at-risk older adults, reside in the community, it is essential to evaluate interventions in these settings. Most of these interventions were delivered by nurses and nursing assistants, and further evidence is needed to explore the transferability of these interventions to other HCPs such as physicians and other AHPs. The lack of supportive evidence for outcomes does not necessarily reflect a lack of effect but perhaps the lack of high quality, studies at low risk of bias assessing and reporting outcomes. Ideally further adequately powered RCTs, designed to overcome implementation barriers, and that monitor the level to which the intervention is followed are needed to effectively assess efficacy of interventions and draw conclusions. This review provides a groundwork for developing future studies integrating non-dietetic HCPs involvement in the nutritional care of nutritionally at-risk populations.

4.2 Evaluation of the quality of reporting of interventions

4.2.1 Introduction

Findings from the above systematic review highlighted the very-low and low-quality evidence on the efficacy of non-dietetic HCP interventions in managing malnutrition and the need for future studies that address the barriers and limitations in these studies. A key limitation among intervention studies is a lack of description of the interventions, which makes it difficult for HCPs or patients to implement interventions successfully (Hoffmann et al., 2016). Therefore, identifying and describing the strengths and limitations of the reporting of interventions permits adequate replication of research interventions and translation into clinical practice (Hoffmann et al., 2016). Additionally, highlighting the gaps in reporting may also influence the quality of reporting of interventions in future studies. The Template for Intervention Description and Replication checklist and guide (TIDieR) provides guidance for the evaluation of studies to assess their completeness and enable replication (Hoffmann et al., 2016).

To my knowledge, only one study of nutritional interventions for the management of malnutrition has reported on the quality of reporting ONS-based interventions from 76 RCTs in populations with malnutrition or nutritional risk (Liljeberg et al., 2018). Therefore, the aim of this study was to use the TIDieR checklist to assess the quality of reporting of the nutritional interventions delivered by non-dietetic HCPs to patients at risk of malnutrition across all healthcare settings included in the preceding review.

4.2.2 Methods

4.2.2.1 Study identification

Eighteen studies included in the systematic reviews of nutritional interventions delivered by non-dietetic HCPs (Dabbous et al., 2021) were included for evaluation. Data on intervention details were extracted using the TIDieR 12-item checklist (Hoffmann et al., 2014).

4.2.2.2 Assessment of reporting quality

A protocol was developed by myself (MD) and TT (an undergraduate student supporting this study as part of final year project) to define the criteria on which to base judgements of reporting quality for each element. Since we were interested in the HCP delivered interventions within the context of malnutrition, the criteria within the protocol provided these definitions for judgements and considered these elements when judging the reporting of interventions.

Protocol development

The TIDieR checklist consists of 12-items and guidance which provides a more detailed but generic description of each item. In order to use the checklist for a specific group of studies, a topic-specific protocol is required to customise understanding on each item in the context of this topic. Development of the protocol was a three-step process. Two studies from those included within the review were chosen at random and evaluated using the TIDieR checklist by the two researchers working independently. The judgements made by each researcher allowed development of the first draft of a protocol (**Appendix 8**). The purpose of the protocol was to define the elements which needed to be reported by a study for each item in order to receive a

score of complete, partially complete (some but not all of the elements judged to be required for that item were included) or missing. Results were displayed in a summary table by each researcher and used to inform discussion with PhD supervisors (CB and CEW) with the aim of reaching a consensus for each items. The first draft of the protocol was then used to rate five additional studies by MD and TT working independently, and a final discussion and minor amendments to the protocol were made. The final version of the protocol was used to assess the adequacy of reporting of nutritional interventions for all 18 studies with the two researchers working independently.

4.2.2.3 Data management and data analysis

Judgements for each item of the checklist for each study together with some explanatory notes supporting the judgement were first summarised in a Microsoft Excel version 15.34 (Microsoft Corporation, Redmond, Washington) spreadsheet. Judgements made by each researcher (MD and TT) were converted to numerical scores as follows: 1=complete; 2=partial; 3=missing and then transferred to IBM SPSS v26 (IBM Corporation, Armonk, New York) for descriptive analysis and evaluation of inter-rater reliability. When a checklist item was judged to be not applicable (N/A) to that study it was scored as 4. The proportion (%) of studies scored as complete, partial, missing or N/A were calculated for each item of the checklist and displayed in a table. Inter-rater reliability for each item of the checklist was evaluated using Cohen's Kappa statistic for the strength of agreement between the two reviewers. Cohen's Kappa statistic was not computable if one of the reviewers reported the same rating for all studies within a checklist item. Judgments on the strength of agreement was based on the grading suggested by Landis & Koch (1977)

as follows: <0.0 = poor; 0.0-0.20 = slight; 0.21-0.40 = fair; 0.41-0.60 = moderate; 0.61-0.80 = substantial; 0.81-1.0 = almost perfect.

4.2.3 Results

Results of the evaluation of reporting of nutritional interventions based on the 12-item TIDieR checklist and the inter-reliability agreement for each item for 18 studies are displayed in **Table 4.7**. The full description of the rationale for each rating for each item within the checklist for all 18 studies as evaluated by MD can be found in the **Appendix 9.**

4.2.3.1 Reporting of nutritional interventions

Checklist items judged to be mostly reported as complete included items 2, 4, 6 and 7. Description of the study rationale was complete for most studies (89%), with no studies reported as having a missing description of the rationale (item 2). All but one study (94%) had a complete reporting of the intervention procedures (item 4). For the study reporting partial reporting for item 4, the procedures were described but not how they were delivered. All studies had a complete reporting on the mode of the intervention delivery (item 6) and location (item 7).

Checklist items judged to be mostly reported as partially complete included items 1, 3 and 8. Reporting of titles (Item 1) was partially complete in most studies (89%), with at least one of the elements (profession, intervention or study type) missing from the title. Reporting of the materials used in the intervention (item 3), which included both the production and their availability used by the professional or population, was either partially (72%) reported or missing (28%), with no studies having a complete report of materials. For studies with partial reporting of materials used, this was mainly reporting the production of materials provided to the HCPs for training, however not

for patients, with limited reference to the availability of these materials. Similarly, for item 5, reporting of who provided the intervention was partially reported in approximately half of the studies (55%). Partial reporting varied between the studies, with different elements missed such as not describing who provided the intervention, or who trained the professional, or how the professional was recruited. 89% of studies partially reported the when' and 'how much' the intervention (item 8) was provided. Checklist items judged to be mostly reported as missing included items 9, 10, 11 and 12. More than half of the studies (69%) of studies did not tailor the intervention to the setting or individuals provided (item 9), and none of the studies modified the intervention within the intervention period (item 10). Assessment or planning of the fidelity of the intervention (item 11) was not reported in 83% of studies. Similarly, majority of studies (89%) did not report on actual intervention fidelity (item 12).

Table 4.7: Proportion of studies rated as complete, partial or missing for each TIDieR item and inter-rater reliability of items for the total included studies (n=18)

	Summary of TIDieR evaluation in total studies (n=18)			Inter-rater reliability[a]	
TIDieR Item	**Complete N (%)**	**Partial N (%)**	**Missing N (%)**	**Cohen's kappa (κ)**	**p-value[b]**
Item1: Brief name	2(11)	16(89)	0	0.775	p<0.001
Item 2: Rationale**	16(89)	2(11)	0	not computable	-
Item 3: What materials	0	13(72)	5(28)	0.874	p<0.001
Item 4: What procedures	17(94)	1(6)	0	-0.038	p=0.716
Item 5: Who provided	7(39)	10(55)	1 (6)	0.723	p<0.001
Item 6: How	18(100)	0	0	not computable	-
Item 7: Location	18(100)	0	0	not computable	-
Item 8: When and how much	2(11)	16(89)	0	0.500	p=0.007
Item 9: Tailoring[c]	6(33)	0	0	0.640	p=0.006
Item 10: Modifications[c]	-	-	-	not computable	-
Item 11: How well adherence (planned)	1(6)	2(11)	15 (83)	0.432	P=0.013
Item 12: How well adherence (actual)	1(6)	1(6)	16(89)	0.647	p<0.001

[a]Inter-rater between two reviewers (MD and TT); Item scores based on evaluation by MD

[b]p-value is significant at p<0.05

[c] Item 2: Not computable due to one of the reviewers (TT) reporting the same rating for all studies; Items 6-7: Not computable due to one of the reviewers (MD) reporting the same rating for all studies; Item 9: 12 studies (67%) had a score of 'none' because the intervention was not tailored; Item 10: Not computable due to one of the reviewers (MD) rating all the studies as having no modifications reported (none).

4.2.3.2 Inter-rater agreement

All 18 studies were rated by two reviewers and variation in judgements of reporting quality was compared using Cohen's kappa statistic. Almost perfect agreement (0.81 – 1.0) was achieved for only one item, item 3, which assessed the description of materials used in the study. There was substantial inter-reliability agreement (k0.61-0.80) in judgements for three of the 12 checklist items. There was moderate inter-reliability agreement in judgements for three items, items 8, 9 and 11, reporting when and how much the intervention was provided, tailoring and the planned adherence, (k0.500 and k0.432, respectively). Item 4, reporting the procedures of the intervention had a poor agreement or disagreement between the two reviewers (k -0.038), where the protocol required the studies to report what was provided to deliver the nutritional intervention and how these procedures were carried out. Four items were not calculable. For item 2, the study rationale, this was due to one of the reviewers (TT) rating all the studies as complete, similarly for items 6 and 7 this was due to MD rating all the studies as complete. For items 10, this was due to one of the reviewers (MD) rating all the studies as having no modifications reported (none).

4.2.4 Discussion

This study demonstrated incomplete reporting for all but two items of the TIDieR checklist in studies of non-dietetic HCP delivered nutritional interventions for the management of malnutrition, with no study completely reporting all items included in the checklist. Items judged to be completely described for all studies were how and where the intervention took place (items 6 and 7 respectively). The main elements within studies which were poorly or partially described were the study name, the materials used within the interventions and the details surrounding who provided,

when and how much the intervention was implemented and information on adherence to the intervention. The main elements of the study with an almost perfect or substantial inter-reliability of judgements between the two researchers were the study name, materials, who provided the intervention and the actual adherence to the intervention (Items 1, 3, 5, and 12 respectively), with one item reported as poor agreement (item 4).

In the study by Liljeberg et al. (2018), evaluating the reporting of ONS interventions within RCTs, only 3% of the studies provided fully complete reporting of all the TIDieR items. Other studies which include evaluation of physiotherapy interventions also consistently highlight the poor reporting of interventions ranging from 11%-31% (Yamato et al., 2016). One study evaluating the reporting of interventions of alcohol use disorders highlighted a mean of five checklist items as being fully reported among 56 studies screened (Vassar et al., 2020). Evidence from the literature has highlighted that the description of the rationale is the main item that has complete reporting (Liljeberg et al., 2018; Vassar et al., 2020; Yamato et al., 2016). Evaluation of the collective 18 studies are the least well described compared with other literature, with no study completely reporting all items.

Incomplete reporting limits the capability to replicate the studies and implement these interventions in practice and to influence the design of future research which can also contribute to "research waste" as a result of unpublished or unusable data (Chan et al., 2013; Ioannidis et al., 2014). Additionally, incomplete reporting may limit comparisons between intervention types and syntheses of their effect on outcomes. For example, not completely reporting items such as who delivered the intervention results in the inability to judge which HCP may be effectively delivering the nutritional intervention among the nutritionally at risk population. As highlighted in

the findings, most studies did not report or only partially reported on materials used for the interventions, with no studies referencing a protocol, primary paper or supplementary material. It is vital to reference where these details may be found in the primary paper for easy access or to provide online resources (Hoffman et al., 2014) to overcome incompleteness of reporting which may be due to journal word restrictions. Contacting authors for intervention details may be time consuming and not feasible to be carried out by clinicians and other HCPs for implementation (Hoffman et al., 2013). Similar to our findings the provider of the intervention was reported in only 36-38% of the studies of ONS interventions (Liljeberg et al., 2018). Reporting the training and healthcare background of staff implementing interventions is a key element within the checklist which may impact the outcomes of interventions (Hoffman et al. 2014). Our protocol divided this question into 3 elements; whether a description of training was provided; the duration and frequency of any training sessions, and how professionals were recruited. Unlike, the study by Liljeberg et al. (2018), the location of delivery of interventions was reported in all the studies in our analysis, allowing interpretation in future studies of the setting an intervention may be best delivered.

The limited reporting on adherence to interventions highlighted by our findings as well as the literature (Abell et al., 2015; Liljeberg et al., 2018) is important to assess participant compliance to interventions and accurately interpret adherence rate and intervention effectiveness (Zhang et al., 2014). High heterogeneity among study interventions and variability in reporting intervention factors, such as dose, duration, frequency, timing and adherence are all key limitations in understanding the efficacy of nutritional interventions of outcomes of study, specifically among nutritionally vulnerable populations (Martin-Cantero et al., 2021). This was highlighted within the findings of the systematic review (Dabbous et al., 2021, section 4.1), where

incomplete reporting and variability contributed to the lower study quality within the review and the inability to make conclusive recommendations.

There was mixed overall mixed inter-reliability agreement across the checklist items. Differences in interpretations of some of the elements within some of the items of the checklist may be due to the differences in experiences among the reviewers (e.g. MD may have more clinical dietetic experience) or items not being clearly presented within the papers, suggesting the need for explicitly providing intervention details within the primary papers. This can be seen in the checklist item with poor disagreement (item 4) or were not calculable due to the discrepancy of one reviewer reporting the same rating for all studies while another did not agree (items 2, 6-7, 10).

Strengths and Limitations

This study included a sample derived from a comprehensive search of the literature on nutritional intervention studies among nutritionally at-risk populations delivered by non-dietitians. The design of our protocol provided a rigorous evaluation of the interventions through defining elements that are "complete", "partial", or "missing". For example, within the first item of the checklist, we required the study name to highlight the key words identifying; the profession, nutritional intervention in the context of malnutrition and the study type. This resulted in this item to be partially complete in majority of the studies, which was contrary to the literature which has highlighted this a main item that is completely reported (Liljeberg et al., 2018; Vassar et al., 2020; Yamato et al., 2016). Checklists which include the TIDieR tool, as well as other guides such as the CONSORT (Moher et al., 2001) and SPIRIT (Chan et al., 2013) statements may all provide standardized approaches for reporting of interventions, and address the problems of incompleteness. The strength of the TIDieR tool provides detailed guidance on the level of intervention details required in

reporting through the categories of the checklist (T. C. Hoffmann et al., 2014). Additionally, a strength of this study is the use of two reviewers (MD and TT) to develop the protocol, independently review the studies and explore inter-rater reliability.

We did not contact authors regarding missing information in studies which may be a limitation, however the nature of the TIDieR checklist relies on the needed information be clearly reported within studies to not require the delays of contacting authors as mentioned earlier. We attempted to consult protocols for studies, however no protocols were published among the included studies. Additionally, for two of the items the Kappa was not calculable, thus the inter-rater reliability was not assessed for these items.

4.2.5 Conclusions

This study highlighted poor reporting of intervention details in studies of non-dietetic HCP delivered nutritional interventions for the management of malnutrition. Incomplete reporting limits the capability to replicate, make comparisons and implement these interventions in practice and their ability to influence future research designs. To improve intervention reporting, replication and limit research waste, future work should ensure studies report intervention details and references to materials within their primary papers. Our findings highlighted key elements of missing information within nutritional interventions in populations at risk of malnutrition. The protocol developed may also inform reporting of future interventions within this field. Furthermore, in order to improve interpretation of intervention efficacy on outcomes, utilisation of the TIDieR checklist is a standardized approach to reporting intervention details.

Chapter 5: Nutritional Care Practices in Falls Prevention Services in England

5.1 Introduction

The work completed in chapter 3 (cohort study) identified falls prevention services as key points of contact with older adults living in the community. Forty-eight of 273 (18%) community contacts were with the community falls service (CRAFS), second only to contacts with district nursing services. Thirty-five of 48 (73%) individuals accessing CRAFS were identified as at risk of malnutrition by the author (BMI <20 kg/m^2 or weight loss in the previous 3-6 months), yet only 7 (11%) were identified as at nutritional risk by healthcare professionals (HCPs) and 23 (37%) received nutritional care during the year of study. Additionally, secondary to respiratory conditions, the main reason for healthcare contact among the nutritionally at-risk group within the cohort study was for intervention following a fall. Falls prevention services typically involve multidisciplinary care, provided mainly by physiotherapists, nurses and physicians, and present an opportunity for the identification of nutritionally at risk older people and the initiation of nutritional care. Before exploring the potential role of nutritional care, it is necessary to understand the nature and extent of current nutritional care provision in falls services. This chapter will set the scene for the potential integration of nutritional care into falls services, by conducting a cross-sectional online survey of current nutritional care practices in England.

Increased risk of falling and associated injury (e.g. fractures) is common among older adults living in the community and risk increases with age (WHO., 2018) with 30% of community living adults over the age of 65 years and 50% of those over the age of 80 experiencing at least one fall each year (WHO, 2018). Falls result in

functional impairment and decreased quality of life, increased healthcare costs and risk of mortality (Grossman et al., 2018; Rubenstein, 2006; Stevens et al., 2006). Risk factors for falls in community dwelling older adults include intrinsic factors such as age, muscle weakness, gait and balance problems and poor vision as well as extrinsic factors such as lack of hand rails, slippery surfaces, or poor footwear (Deandrea et al., 2010; Rubenstein, 2006). Loss of muscle mass and strength and malnutrition are among the important modifiable risk factors contributing to falls and functional decline (Kim et al., 2010; Moreland et al., 2004). Evidence from Canada, The Netherlands, and Sweden suggests an association between increased malnutrition risk and increased risk of falling in older adults living at home (Johnson, 2003; Meijers et al., 2012; Westergren et al., 2014). A systematic review and meta-analysis of six studies (n=13,349 participants) exploring the association between falls and malnutrition risk found a 64% increased risk of falls in malnourished community-dwelling older people (≥75 years) when compared to well-nourished subjects, based on the MNA screening tool or a nutritional evaluation criteria such as a BMI<20 (Trevisan et al., 2019). There is a lack of evidence in the United Kingdom (UK) on the prevalence of malnutrition among individuals who have experienced a fall however, data from Australia indicates a prevalence of 12-15% of medium/high risk of malnutrition (using the Mini Nutritional Assessment (MNA) screening tool) in older people who fall in the community (n=250 participants ≥67 years) (Visvanathan et al., 2003; Vivanti et al., 2009).

Similar to falls, malnutrition is associated with poor outcomes including reduced quality of life (Kvamme et al., 2011; Stenhagen et al., 2014), impaired activities of daily living (Cereda et al., 2016; Stevens et al., 2014), increased length of hospital stay and readmissions (Siracuse et al., 2012; Stratton & Elia, 2006) and increased health

and social care costs (Elia, 2015; Royal College of Physicians, 2010). chapter 1 highlighted the availability of national guidelines for the prevention of falls and interventions for the management of falls (Hopewell et al., 2019; NICE, 2013). Additionally, chapter 1 also highlighted the limited, low quality evidence on the impact of nutritional strategies (alone or as part of multi-component interventions) on falls and falls related outcomes (Hopewell et al., 2019), also summarised in **Appendix 10**. However, evidence addressing nutritional interventions in other conditions, such as chronic obstructive pulmonary disease (COPD) and among nutritionally vulnerable older adults have suggested a positive impact of improving nutritional status on patient outcomes such as functional capacity and quality of life (Collins et al., 2013; Reinders et al., 2019).

HCPs in regular contact with nutritionally vulnerable older adults include multidisciplinary teams providing comprehensive assessment and intervention to decrease risk of falls and associated injuries within falls services (Hill & Schwarz, 2001; Palvanen et al., 2014; Stolz et al., 2002), however nutrition appears to have a limited role within these services in the UK. Falls clinics present an opportunity to identify individuals at nutritional risk who might benefit from nutritional intervention while they are in contact with the falls service. Nutritional screening, which can be performed by trained non-specialists using a validated tool, is the first step in the nutritional care process to identify individuals at nutritional risk (British Dietetic Association, 2020a) (NICE, 2006), followed by first-line assessment and management by non-dietetic HCPS and onward referral to a dietitian if necessary (NICE, 2006). However, there is a lack of evidence on which nutritional care practices are currently provided within falls services and by whom. To provide a basis for the potential integration of nutrition into falls services, this study aimed to identify the current

nutritional care practices in falls services across England by answering the following research questions:

1. What are the nutritional care pathways in place within falls services and who is involved?
2. Are nutrition screening procedures in place within falls services and how are the procedures implemented?
3. Is nutritional care provided to individuals within falls services and how and by whom is this provided?

5.2 Methods

5.2.1 Study Design and Questionnaire Development

A cross-sectional online survey of falls clinics and services across England was circulated between September 2019 and January 2020. Healthcare professionals working within a falls service were requested to complete the survey. The survey design was guided by national clinical guidelines (British Dietetic Association, 2020b; NICE, 2013, 2017) and consisted of 29 questions on the following topics (**Appendix 11**):

(1) nutritional care policy, nutritional screening and assessment procedures and nutritional advice, onward referral and documentation

(2) who performs these procedures and how often (e.g. dietitian, physiotherapist or other HCPs)

(3) falls service demographics (e.g. location, setting, team, funding).

An option for free text comments was provided for respondents to provide further information related to nutrition practices within their falls service. The survey was piloted with three HCPs (nurse, dietitian, physiotherapist) to test clarity and practicality. Changes incorporated within the survey following piloting included

clearly stating who the survey is intended for at the beginning (e.g. HCPs working within a falls service), the addition of a question on referral procedures for dietitians and providing the 'I don't know' option for a few of the questions, where it was highlighted that some HCPs may not know how a falls service is funded, how a dietitian is funded or the band of the dietitian. The survey took approximately 5-10 minutes to complete.

5.2.2 Survey Procedures

The final version of the survey was circulated electronically using an online survey tool (Survey Monkey, San Mateo, California, USA). There is no national list of falls services within the UK, thus a variety of sources were used to locate falls services and optimise responses. The survey was circulated by email to falls clinics identified through the College of Optometrists Falls Directory list (The College of Optometrists, 2021) and additional online searching. Falls and physiotherapist networks were contacted to share the survey with their membership and newsletters. To maximise the number of responses, the survey was also circulated through a nationwide falls network for HCPs by email, posted on a physiotherapy society newsletter and website, and advertised through social media (Twitter), inviting individuals to complete the survey or to pass it on to a relevant colleague.

5.2.3 Consent procedures and ethics

A written description of the research was provided at the start of the survey and anonymous submission of a completed survey implied consent to participate. No identifiable information was collected regarding the individual completing the survey and the organisation they worked for. Two questions at the beginning of the survey asked if (1) the respondent was a healthcare professional in a falls service in

England and (2) consent to participate. The research was registered with the King's College London ethics office (registration number MRS-18/19-14198) and ethical approval was granted on 9th August 2019.

5.2.4 Data analysis

Data were exported from the survey into Microsoft Excel version 15.34 (Microsoft Corporation, Redmond, Washington) and descriptive data on proportions were reported and analysed using Microsoft Excel and SPSS v26 (IBM Corporation, Armonk, New York). Free text comments were reported within the results.

5.3 Results

5.3.1 Sample and demographics

Sixty-seven falls services were identified in England through the College of Optometrists' Falls Directory list and an additional 28 through online searching. A total of ninety-five services was identified, however only 47 (50%) had a valid email address. Therefore, the survey was sent directly to 47 services although HCPs from other falls services may have seen the social media posts and responded.

Seventy-three surveys were received, of which 10 (14%) were excluded because the forms were blank. In total, results from 63 respondents representing falls services across England were included for analysis. In fifteen surveys, respondents had skipped some questions (n=48 complete surveys), therefore results are reported as proportion answered for each question from the 63 respondents.

Data on demographics, care setting and funding are summarised in **Table 5.1.** Forty-eight of 63 (76%) respondents indicated their profession, of which thirty-five (73%) were physiotherapists and seven (15%) were nurses. Forty-two of 63 (67%)

respondents reported data on the number and types of HCP posts included in their service. Physiotherapists and occupational therapists were most likely to have funded posts within the team, while other professions were less likely to be part of the team, especially dietitians, pharmacists and podiatrists (table 5.1). There were no psychologist posts, however two services reported having a mental health nurse post. One service also reported having a pharmacist within their team. Forty-five of 63 (71%) respondents reported on whether formal referral procedures existed in their service, of which thirty-four of 45 (76%) services had referral procedures for dietitians, fifteen (33%) for psychologists, and one each for pharmacists (2%) and podiatrists (2%).

Table 5.1: Demographics of in falls services **(n=63)**[a]

	N (%)
Location of Falls Service (n=47)	
North West England	11 (23.4)
London	10 (21.3)
South East England	7 (14.9)
North East England	5 (10.6)
East Midlands	5 (10.6)
East of England	3 (6.4)
Yorkshire	2 (4.3)
West Midlands	2 (4.3)
South West England	2 (4.3)
Care Setting (n=48)	
Community	31 (64.6)
Hospital	13 (27.1)
Rehabilitation facility	3 (6.3)
GP or primary care	1 (2.1)
Care home	0(0)
Sports facility	0(0)
Funding Source (n=48)[b]	
CCG	19(63)
Other	11(23)
Don't know	18(38)
Funded Posts (n=42)[b]	
Physiotherapist	37(88)
>1 post	14(38)
≥ 2 posts	23(62)
Occupational therapist	28(67)

>1 post	15(54)
≥ 2 posts	13(46)
Medical practitioner	15(36)
>1 post	5(33)
≥ 2 posts	10(67)
Nurse	20(48)
>1 post	10 (50)
≥ 2 posts	10 (50)
Dietitian	3(7)
>1 post	3 (100)
≥ 2 posts	0 (0)

CCG: Clinical Commissioning Group
[a]Due to missing information from certain questions by individual respondents, not all totals equal n=63.
[b]More than one answer may be selected, total >100%

5.3.2 Nutritional care practices in falls services

5.3.2.1 Written policies, screening procedures and re-screening

Only six of 63 (10%) respondents reported that they had a written nutritional care policy (**Table 5.2**) in their falls service although 41 (65%) reported that they routinely carried out nutrition screening procedures. Thirty-four of 42 (81%) respondents reported routinely using a "screening tool", of which 30 (73%) described the tool used. Of these thirty, twenty-nine (97%) used the Malnutrition Universal Screening Tool (MUST) (BAPEN, 2018) and one used the MNA screening tool (Rubenstein et al., 2001). While the majority reported that they screened for nutritional risk status on first contact with the service (35 of 39 (90%) respondents), only six of 39 (15%) reported that they regularly re-screened throughout a person's contact with the service. Re-screening procedures appeared to be ad hoc and informal since comments included "when appropriate", "depending on risk score", "depends on rate of loss", or "if patient reported any changes". At first visit, nutrition screening was most frequently performed by either nurses or physiotherapists (**Table 5.3)**.

Table 5.2: Nutritional Care Practices and Dietetic Involvement in Falls Services (n=63)[a]

Nutritional Care Practices	
Written nutritional care policy (n=63)	
Yes	6 (9.5)
No	48 (76.2)
Don't know	9 (14.3)
Routine nutrition screening procedures (n=63)	
Yes	41 (65.1)
No	20 (31.7)
Don't know	2 (3.2)
Nutrition screening tool routinely used (n=42)	
Yes	34 (81.0)
No	6 (14.3)
Don't know	1 (2.4)
Other	1 (2.4)
Written criteria for re-screening after first contact (n=32)	
Yes	6 (18.8)
No	18(56.2)
Don't know	8(25.0)
Nutrition procedures routinely recorded in client records (n=57)	
Yes	41(71.9)
No	12(21.0)
Don't know	4 (7.0)
How are the records accessed in other healthcare settings within your local area (n=40)[b]	
Electronic platform	34 (85.0)
Email	4(10.0)
Post	6(15.0)
Routine documentation on discharge (n=55)	
Yes	7(12.7)
No	42(76.4)
Don't know	6 (10.9)
Dietitian involvement	
Dietitian involved in nutritional care within service (n=54)	
Yes	18 (33.3)
No	35 (64.8)
Don't know	1 (1.9)
How is the dietitian involved in nutritional care within service (n=16)[b]	
Part of the falls clinical team	2 (12.5)
Accessed through referral to local dietetic services	2(75.0)
Referral to other access mode[c]	4 (25.0)
Dietitian(s)' Agenda for Change pay Band (n=17)	
Band 5	1 (5.9)
Band 6	7 (41.2)
Band 7	2 (11.8)
Don't know	7 (41.2)
Type of dietitian contact with clients (n=17)[b]	
Face-face in clinic/ward	11 (64.7)
Home visits	9(52.9)
Telephone	7(41.2)
Group sessions	3(17.7)

Don't know	1 (5.9)
Interventions routinely provided within falls service (n=47)[b]	
Exercise	45(95.7)
Environment/assistive technology	43 (91.5)
Medical/clinical care	26 (55.3)
Medication	19 (40.4)
Nutritional counselling	9 (19.2)
Vitamin/mineral supplements	8 (17.0)
Psychological	7(14.9)
ONS prescription	2 (4.3)

ONS: oral nutritional supplements
[a]Due to missing information f**or** some questions, not all totals equal n=63.
[b]More than one answer may be selected, total >100%
[c]Included: nutrition talks on healthy eating or healthy bones within exercise groups

Table 5.3: Who performs nutrition screening in your service and how often (n=39)?[a]

Professional[b]	**At first visit**	**At follow up visits**	**Weekly**	**Monthly**	**Occasionally**	**Never**	**Don't Know**
Physician (n=9)	2	0	0	1	2	2	3
Nurse (n=23)	21	6	2	1	0	1	0
Pharmacist (n=7)	0	0	0	0	1	3	3
Physiotherapist (n=32)	24	6	1	1	6	1	2
Occupational Therapist (n=23)	17	6	1	1	4	1	2
Dietitian (n=12)	3	1	0	0	2	5	1

[a]Due to missing information for some questions, not all totals equal n=63.
[b]More than one answer may be selected, total >100%

5.3.2.2 Assessment and dietary advice

Fifty-six of 63 (89%) respondents completed questions relating to nutritional assessment, of which thirty-three (59%) reported routinely measuring clients' dietary intake, 32 (57%) measured weight, 31 (55%) measured height, and 29 (52%) calculated body mass index (BMI), **Figure 5.1**. In contrast, nine of 56 (16%)

respondents reported that weight, height, and dietary intake were never assessed in their service. Ten of 56 (18%) respondents reported never calculating BMI and no respondents reported calculating BMI at follow up visits. Twenty-one of 56 (38%) respondents reported that nutritional assessments were completed in their service while 14 (25%) reported that nutritional assessments were never completed. Twenty-five respondents (47%) reported that their service provided nutritional advice and counselling however, in those who described the types of advice provided (n=25), the advice mainly related to bone health and hydration (n = 4). In summary, routine nutritional care practices were not carried out in at least 20% of falls services (figure 5.1) and only about 10% of services reported performing nutritional care practices such as measuring weight, assessing dietary intake, and completing a nutritional assessment at follow up visits (figure 5.1).

5.3.2.3 Dietitian involvement

Eighteen of 54 (33%) respondents reported on dietetic involvement in their service (table 5.2) and of these, sixteen reported on how dietitians were involved. Only two of 16 (12.5%) respondents reported that dietitians were directly funded as part of the falls team while most clients were referred to other local dietetic services (n=12, 75%). Eleven of 16 (65%) respondents reported that clients had face-to-face contacts with dietitians, nine (53%) through home visits, seven (41%) through telephone calls and three (18%) through group sessions.

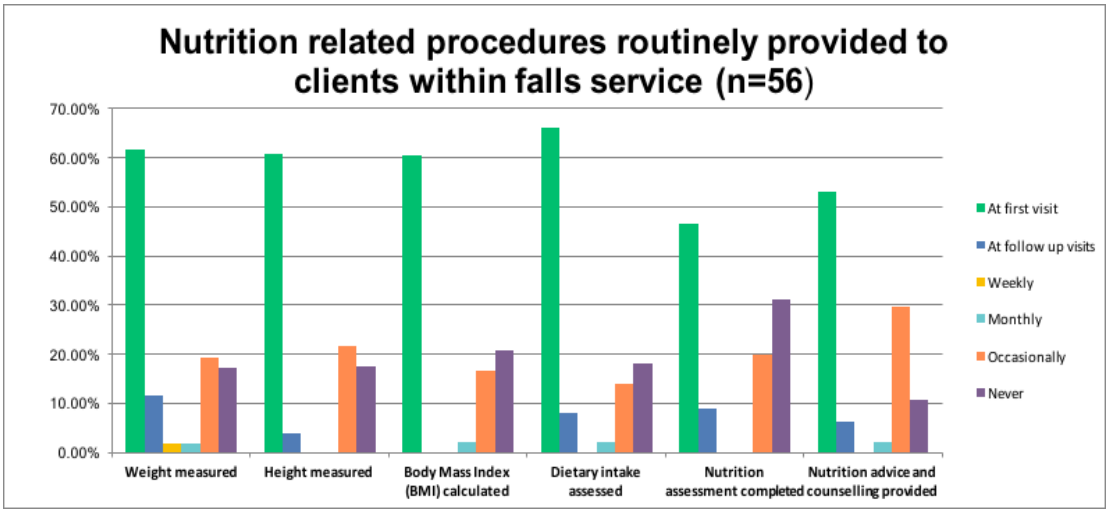


Figure 5.1: The categories and frequency of nutrition related procedures routinely provided to clients within falls services

5.3.2.4 Nutrition care plans & written resources

Forty-seven of 63 (75%) respondents provided information on the routine nutritional interventions provided in their service (table 5.2). All but one service provided at least two of these interventions (98%). Routine nutritional counselling was reported by only nine of 47 (19%) respondents. Of these, eight provided vitamin and mineral supplements, of which three specified prescribing vitamin D or calcium supplements and conducting a bone health assessment. Only two of 47 (4%) respondents reported that oral nutritional supplements were prescribed in their service.

Figure 5.2 provides details of the nutrition and falls information provided to clients using their service. Written nutrition information was delivered as a diet plan in thirty of 51 (59%) services and was most often delivered by a dietitian (18 of 30, 60%). Thirty-seven (73%) respondents reported providing falls specific leaflets which included nutrition information, 67% (n=34) reported providing a general leaflet which included nutrition information, and 73% (n=37%) reported providing verbal information on nutrition, all of which were primarily delivered by physiotherapists (68%, 65% and 65%, respectively). Eleven (22%) services reported no nutritional

information provided by HCPs. Free text comments regarding the nutrition information and overall additional comments are displayed in **Appendix 12**, and focus on the potential inclusion of a dietitian in the team and the challenges associated with staff shortages and training.

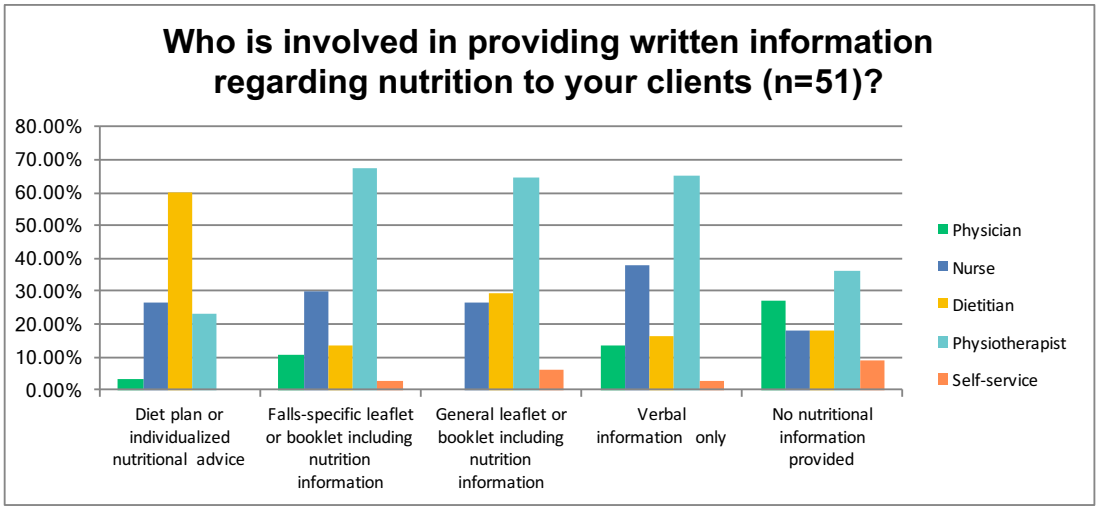


Figure 5.2: Description of the written information regarding nutrition and the healthcare professionals involved in providing written information to clients within falls services (n=51)

5.3.2.5 Documentation and monitoring

Forty-one of 57 (72%) respondents reported recording nutritional care procedures routinely in client records, of which 34 (85%) reported using electronic platforms for communication between services (table 5.1). Of the 55 respondents reporting on discharge documentation, only seven (12%) recorded nutritional information routinely on discharge from their service. All seven of these services sent information to the GP either electronically (n=4, 57%), by post (n=3, 43%), and/or by clinic letter (n=2, 29%).

5.4 Discussion

The aim of this cross-sectional survey was to provide information on the nutritional care practices currently carried out in falls services and the HCPs involved. This survey showed that nutritional care policies and practices, and dietitian involvement, are limited within hospital and community-based falls services in England. There were few funded dietetic posts, with most clients referred to generic dietetic services. Only about one in ten falls services had a written nutritional care policy and one third of services did not carry out routine nutritional screening procedures, with further re-screening performed infrequently. Overall nutritional care practices were ad hoc and usually a one-off practice at first contact with the service, with 20% services not providing nutritional care at all and subsequent nutritional review rarely occurring. Most nutritional care was provided by physiotherapists (followed by nurses) through performance of nutritional screening or the provision of leaflets containing nutritional information.

Evidence from the literature indicates an association between malnutrition and falls risk (Trevisan et al., 2019), thus a significant proportion of older adults (>60 years) accessing falls services may be at nutritional risk. A descriptive study evaluating nutritional screening in an Australian multidisciplinary falls clinic (n=90 participants ≥60 years), which did not include a dietitian, revealed that 12% participants were classified as "undernourished" based on anthropometric measurements (Stolz et al., 2002). Nutritional screening of older adults (n=152 participants ≥70 years) attending medical falls services in New Zealand found that 23% of screened participants were at nutritional risk using the SCREEN II (Seniors in the Community: Risk Evaluation for Eating and Nutrition, version II) tool (Keller et al., 2005), and 31% were at high

nutritional risk (Watson et al., 2010). If similar rates of malnutrition or high nutrition risk occur in UK falls service, this warrants the need for improved opportunities for recognition of nutritionally vulnerable individuals through the implementation of nutritional management pathways within falls services. Despite the availability of international clinical guidance (Kondrup et al., 2003; NICE, 2006), significant challenges in the identification and management of malnutrition risk across healthcare settings remains, resulting in un-recognized and under-treated malnutrition in the community (Green & James, 2013; Ross et al., 2011), (Elia et al., 2005).

While the evidence is currently of low quality, nutritional interventions within falls services have the potential to contribute positively to patient outcomes in the multidisciplinary management of falls and falls prevention (Gillespie et al., 2012; Hopewell et al., 2019). Falls services provide an opportunity for the identification and first-line management of nutritionally at-risk individuals and onward referral to specialist dietetic services in patients with complex nutritional needs. An observational study in an Australian multidisciplinary falls and fractures clinic for older adults (>65 years), showed six months of multidisciplinary care was associated with a decrease in the prevalence of malnutrition risk from 29% to 15% (based on MNA score <24/30) (Conzade et al., 2019). Additionally, a one point increase in the MNA score was associated with a 0.20 improvement in Short Physical Performance Battery (SBBP) score (95% CI 0.10, 0.31, $p < 0.001$). A similar pre-post study in another Australian falls and fractures clinic, showed that decreased nutritional risk was associated with fewer fractures after 6 months of receiving multidisciplinary, integrated care (Gomez et al., 2019). However, the absence of a control group within the two studies result in the inability to indicate whether changes in outcomes are due to the multidisciplinary care interventions provided and whether the causal role of

change in nutritional status on outcomes is due to the effects of reverse causality (Bucur et al., 2020). Thus, caution is needed when considering the generalisability of these findings.

In this survey, nutritional screening was carried out as a "one-off" procedure, with approximately half of respondents assessing nutritional risk at the first visit alone and rarely during follow up visits. This raises the possibility of missed identification since nutrition risk status may change over time (e.g. due to acute illness or changes in financial, social or psychological status). In a cohort study in Singapore assessing community dwelling older adults at 4-5 years follow up (n=925; mean age 68 years), 8% of participants with a normal nutritional status at baseline, measured using the MNA-SF, were found to become at risk of malnutrition at follow up (Wei et al., 2019). Thus, improving documentation of nutritional issues is recommended while in contact with fall services and ensuring onward referral for individuals at risk occurs on discharge (Kondrup et al., 2003; NICE, 2006). In this survey only 12% of respondents reported recording nutritional care procedures in client records on discharge from the service, thus in the majority of services, whoever took over their care on discharge from the falls service received no information on the client's nutritional status.

While nutritional screening may be performed by non-nutrition specialists, it is not surprising that results indicated other assessment and intervention procedures were rarely performed, since two thirds of respondents did not have a dietitian or know if a dietitian was involved with their service. Physiotherapists and occupational therapists predominated in the falls services and so, unsurprisingly, among the routine multi-disciplinary interventions that were provided, the majority were exercise (96%) and environment/assistive technology (92%). In an Australian survey of 15 falls clinics,

no nutrition interventions were reported by any clinics, however one clinic reported conducting nutritional screening (Australian Nutrition Screening Index tool), one assessing BMI, and two reported "other" nutrition assessment procedure (not described) (Hill & Schwarz, 2001). Similarly, our results reported a limited number of falls services providing routine nutritional interventions. Interestingly, since dietitian involvement was minimal, most falls services reported that physiotherapists were mainly responsible for providing written and verbal nutrition information.

Staffing shortages or insufficient funding may also be factors in the limited dietetic involvement. There are currently 4,584 dietitians working within the NHS compared to 21,170 physiotherapists and 16,203 occupational therapists (NHS Digital, 2021) and these trends in staffing numbers are similar in Europe (European Federation of the Associations of Dietitians, 2012) and Australia (Australian Government Department of Health, 2021). The relatively low number of dietitians in the workforce results in a lack of dietetic capacity to efficiently carry out all nutritional care practices alone and suggests the possible need for nutritional care from other non-specialist HCPs. In one geriatrician-led falls clinic in Vancouver, Canada, a geriatrician and geriatrician assistant conducted the comprehensive assessment for participants which included: comprehensive medical exam, physical function, functional ability, physical activity/exercise, nutrition, medication review, alcohol/smoking review and a home hazard assessment (Davis et al., 2018). This feasibility study found the comprehensive assessment to be feasible and acceptable to participants after one year, with 69% compliance to the recommendations (Davis et al., 2018). One study from the systematic review of HCPs (chapter 4), was conducted in falls prevention services involving a multidisciplinary team of physician, physiotherapist and nurse providing multidisciplinary assessment and management which included nutrition (vitamin D,

calcium and healthy guidelines) (Palvanen et al., 2014). This study demonstrated decreased falls rate after one year of the study intervention (Palvanen et al., 2014). In the study reported by Gomez et al., 2019, the multidisciplinary team consisted of a geriatrician, a nurse, a physiotherapist and an occupational therapist providing integrated care. Nutritional screening using the MNA was performed by the fracture liaison nurse in the study by Conzade et al. (2019) as part of routine care at baseline attendance to the clinic.

Strengths and Limitations

This study is the first to explore the nature and extent of nutritional care practices in falls services across England and provides data to support research into the effect of integrating nutritional care into falls services. To ensure clarity of the questions and response time, the survey was piloted with three multidisciplinary HCPs. To my knowledge there is no known comprehensive list of falls services across England. While we used contacts, and those of researchers and clinicians within south London, to identify 95 falls services across the nation, it is possible that some services may not have been represented in our survey (possibly under-represented in the West and South West of the country). An additional limitation was the number of respondents skipping questions within the survey, with only 48 of 63 (76%) surveys fully completed. While we did not formally explore the reasons for lack of full completion of surveys, it could be hypothesised that some respondents may not have had sufficient knowledge of any nutritional care provided within their falls services to answer the questions or experienced "respondent or survey fatigue" (Hochheimer et al., 2016; O'Reilly-Shah, 2017). Lastly, since HCPs completed the survey on behalf of their service, it is possible that some respondents were from the same falls service (47 emails sent out and 63 responses received).

5.5 Conclusions

Integration of nutritional care within falls services through formal nutritional screening procedures, continued monitoring throughout contact with the service and procedures for onward referral to dietetic services if required has the potential to positively impact patient-centred outcomes however, this survey shows there is currently limited provision of nutritional care and dietetic involvement in falls services in England. Good quality, large RCTs investigating the impact of nutritional interventions in falls services are needed. Additionally, nutritional interventions should be fully described (whether provided alone or as part of a multi-component intervention) including key elements of the intervention such as who provided it, the materials, procedures and duration of the intervention (e.g. as per TIDieR). Lastly, research is needed to understand healthcare professionals' perceptions of nutritional care and insights behind nutritional practices performed. In addition to specialist dietetic input, this may be a first step in empowering non-nutrition specialists towards identification and first-line management of nutritionally vulnerable individuals and delivering timely and effective nutritional care in falls services.

Chapter 6: Perceptions and experiences of nutritional care among HCPs and Service Users within Falls Prevention Services

6.1 Introduction

Studies from the previous chapters show there is a need for improved strategies to detect and manage malnutrition outside the hospital setting. Evidence from the literature (chapter 1) has highlighted that the bulk of malnutrition originates within the community and is costly on the health of patients, carers and healthcare services. Findings from chapter 3 demonstrated the many contacts malnourished patients have with healthcare professionals (HCPs) in the hospital and community however, there is a lack of identification of malnutrition within the hospital and particularly in the community. Evidence from chapter 4 identified two studies addressing falls prevention (Chen et al., 2019; Palvanen et al., 2014) and suggested a potential role for the involvement of non-dietetic HCPs in first-line nutritional management.

Evidence from chapter 3 and the literature (Deandrea et al., 2010; Rubenstein, 2006, Kim et al., 2010; Moreland et al., 2004, Johnson 2003) has also highlighted the many contacts older people who may be at risk of malnutrition have with falls prevention services yet the survey results from chapter 5 shows there is limited nutritional care provision within these services across England. While nutritional care in falls services across England is currently limited, HCPs working in outpatient and community falls prevention services are potential key players in the detection and first-line management of malnutrition in older people. Across care settings and clinical conditions, several factors play a role in the effective identification of nutritionally at-risk individuals and the delivery of nutritional care by non-dietetic HCPs such as

underlying clinical conditions of patients, appropriate screening procedures and clear pathways for referral. Barriers to nutritional screening have been well reported in several reviews including lack of time, knowledge and organisational culture (Green & James, 2013). There remains limited evidence of the perceptions of non-dietetic HCPs of the management of nutrition among older adults at risk of malnutrition and the feasibility of providing nutritional care within the scope of their specialised roles. The low quality, high heterogeneity and the lack of clear reporting of interventions within the studies from the review in chapter 4, makes it difficult to identify which interventions delivered by HCPs could be replicated and translated into clinical practice and be effective on patient outcomes. Additionally, the limited information on key elements of interventions in the review such as the duration, intensity, and procedures, which are important components of both individual and multi-component and/or multi-disciplinary limits their utility in practice (Thorne & Baldwin, 2014). Before we can develop strategies to improve nutritional care practices within falls services, it is important to understand the structure and practices around nutrition within the service and understand the perceptions and experiences of HCPs involved in delivering the services as well as to understand the gaps in practice. Additionally, the perceptions of community dwelling older adult service users are needed to identify any gaps in their nutritional care and any opportunities for promoting engagement with nutritional services. Involving HCPs and patients in designing nutritional intervention strategies can help identify the barriers and enablers in the uptake of nutritional interventions.

6.2 Research Aims

The primary aims

1. To identify and understand non-dietetic healthcare professionals' (HCPs)

perceptions and experiences of current nutritional care services and the nutritional management of older people (service users) accessing an outpatient falls clinic and associated community falls services (e.g. strength and balance classes).

2. To explore older peoples' and their carers' perceptions and experiences of the nutritional services and care provided throughout their healthcare journey.
3. To identify the potential touch points for intervention in the detection and first-line management of nutritionally vulnerable older people.

6.3 Methods

6.3.1 Study Design

A qualitative study was conducted using semi-structured interviews with HCPs, service users and carers. As described in chapter 2, this originally formed part of an Experience Based Co-design (EBCD) study titled *Co-design of nutrition intervention strategies among falls prevention* and was adapted due to Covid-19 circumstances. For this PhD thesis, only the qualitative study is presented.

6.3.2 Ethical Approval

A research ethics application for the CONS-F was submitted via the Integrated Research Application System (IRAS) to the National Research Ethics Service (NRES). The ethics application included submission of study documents (e.g. participant information sheets, consent forms) and outlined all recruitment, consent and research governance procedures. Details are outlined below. A favourable ethical opinion was provided for the research project by the North-West Haydock Research

Ethics Committee (REC reference:19/NW/0288), which included approval by the committee for the purposes of the Mental Capacity Act 2005 and approval by the NHS Health Research Authority and Health and Care Research Wales (HRA and HCRW). Guy's and St Thomas' NHS Foundation Trust (GSTT) research and development (R&D) department provided approval to host the study. The opinion letters can be found in **Appendix 13**.

6.3.3 Study Setting and Set up

The falls prevention services within this study consisted of the (1) Falls Clinic at the Older Persons Assessment Unit (OPAU) and (2) Community Rehabilitation and Falls Services (CRAFS) run by GSTT:

(1) The Falls Clinic, held weekly at the OPAU, provides multidisciplinary assessment of older people (65+ years) who have had a recent fall or are identified as at risk of falls. Service users were either referred from the GP or home setting or acutely after a fall incident. The multidisciplinary team consisted of consultant(s), nurses, occupational therapist(s) and physiotherapist(s). Some service users were referred for further rehabilitation including the outpatient strength and balance classes or CRAFS.

(2) The CRAFS team also consisted of a multidisciplinary (consultant, nurse, occupational therapist and physiotherapist) community-based Falls Clinic and provided rehabilitation programs including community strength and balance classes, exercise classes (held at locations across the boroughs of Lambeth and Southwark), and home-based one-to-one physiotherapy and Otago support (exercise program to decrease falls through strength and balance support, described in detail in the **Appendix 14**). Service users were referred to each

service based on their postcode and/or from the OPAU Falls Clinic for further community support.

6.3.4 Participant Recruitment

6.3.4.1 Eligibility Criteria

The HCP, service user and carer inclusion and exclusion criteria for this study are described in the table below.

Table 6.1: Participant inclusion and exclusion criteria[a]

	Inclusion criteria	**Exclusion criteria**
Healthcare professionals	• Full time, or part time HCPs e.g. physicians, nurses, physiotherapists, occupational therapists and/or other allied health professional (including assistants) from Guys and St Thomas' NHS Foundation Trust • Involved in the care of older people accessing the Falls clinic or associated community service (e.g. strength and balance class)	• Does not work at Guy's and St Thomas' NHS Foundation Trust or not associated with Falls Clinic or the community falls service
Service users	• Male or female patients attending the Falls Clinic at OPAU • Living in the London Boroughs of Lambeth or Southwark • Capable of communicating in English • Capable of providing informed consent, or if incapable of giving informed consent: written assent will be sought from a consultee (e.g. next of kin)	• Not attending falls clinic • A cognitive impairment preventing informed consent (e.g. severe dementia) and no consultee can be identified (procedure for assessment of mental capacity described below in section 8) • Unable to communicate in English • On end of life care or unlikely to live for more

		than three months (assessed by consultant or GP in accordance with local policies)
Carer (service user)	• Relative, friend, or paid caregiver attending the Falls Clinic with a patient participant and involved in the care of the patient	• Not attending falls clinic with a patient participant • If their patient participant member has any of the above exclusion criteria

GP: general practitioner; OPAU: older patient assessment unit
[a]Southwark and Lambeth are culturally diverse boroughs and representation was considered (see below). As this is a PhD project with limited resources, participants not able to communicate in English to understand the study aims were not included.

6.3.4.2 Sampling

A purposive sampling approach was used to recruit a representative sample of multidisciplinary healthcare professionals working within the outpatient Falls Clinic and community falls services (Palinkas et al., 2015). Similarly, this approach was used to recruit a representative sample of service users of different genders, diagnoses, ethnic origin and service experiences, utilising falls services. South London census data for Lambeth and Southwark boroughs was considered to guide demographic representation (Office for National Statistics, 2011). This approach will allow for the selection of individuals involved in providing or experiencing nutrition care or 'information-rich' cases (Cresswell & Plano; Patton, 2014). No formal sample size calculation was performed. For both HCPs and service users, the total number recruited was based on the number needed to ensure data saturation, where no new themes were generated from the interviews, as described in section 6.3.8 below (Braun & Clarke, 2006; Palinkas et al., 2015).

6.3.4.3 Recruitment and Consent Procedures

HCPs were recruited from both the OPAU Falls Clinic and CRAFS. Service users (and carer) were recruited from the OPAU Falls Clinic.

HCPs working within the OPAU Falls Clinic and CRAFS were identified through the clinical leads and/or site's guardian/matron. At the OPAU, the head nurse took on the role of gatekeeper, facilitating weekly access to the falls clinic. Once ethical approval had been obtained the weekly multidisciplinary meeting (MDM) became the central link to the falls clinic HCPs, with permission from the clinical lead (consultant). At the community site, a physiotherapist was the gatekeeper for access to community HCPs. The research was explained both informally and formally within the OPAU and CRAFS MDMs, facilitated by the participant information sheets (**Appendix 15 and 16**). HCPs were then emailed individually to schedule an interview or interviewed on a falls clinic day (detailed in the consent procedures below).

Service users attending the OPAU Falls Clinic were identified by the clinical team from the list of appointments on the day. Potential service user participants and their carers were recruited at first contact by a member of the clinical team (e.g. head nurse) who introduced the study and researcher.

After recruitment, both HCPs and service users had up to 24 hours to decide if they wished to be involved in the study. On agreement to participate, a mutually convenient date for the interview was arranged. At the start of the interview the study was explained again and the potential participant was given the opportunity to ask any questions. HCPs were then asked to complete and sign the consent form (**Appendix 17**). Service users were contacted a few days before the scheduled interview for reminder or to check if any re-scheduling was needed. Service users were given the

option within the consent form for either a narrative video and audio recorded interview or audio recorded interview only (**Appendix 18**).

6.3.5 Data collection procedures

Data collection used face-face, semi-structured interviews with HCPs, service users and carers. Individual semi-structured interviews were chosen to provide in-depth, subjective responses on perceptions and experiences of nutritional care services, while also keeping a structured format using a topic guide (McIntosh & Morse, 2015). In addition to the in-depth detail provided, semi-structured interviews were conducted rather than focus group discussions to provide in-depth detail and to highlight the experiences of the individual healthcare professionals (e.g. nurses, physicians, AHPs) (McIntosh & Morse, 2015). Individual interviews also allow participants to share information and experiences that they may not be comfortable with sharing within a group setting and limiting the effect of group dynamics where some people may dominate a conversation and not all voices are heard (McIntosh & Morse, 2015). For service users, the interviews were conducted individually (semi-structured) to provide a "narrative" view of their personal healthcare journey. The interviews were conducted at a private space within GSTT or King's College London (KCL) and were audio recorded for transcription purposes using an encrypted audio recorder. For service users, there was also the option of conducting the interviews at their home.

6.3.5.1 Creation of topic guides:

The semi-structured interviews were facilitated using a topic guide. Sample HCP and patient/carer topic guides are provided in **Appendix 19** showing the questions (and probes) included during the interviews. Questions within the topic guides were guided by the literature (clinical guidelines, chapter 1) to understand the nutritional practices (identification, first-line assessment and

management) and the aims of the EBCD approach (as per the original protocol) to understand experiences within the service and healthcare journey (Michie et al., 2011; Robert, 2013; Robert et al., 2015) used to address the research questions. The point of care foundation EBCD toolkit also provided sample interview scripts and consent forms to help facilitate the EBCD approach (The Point of Care Foundation). The HCP interview topic guides were piloted with patient public involvement (PPI) (details below) and revised iteratively throughout the data collection process based on topics that arose during the interviews (Busetto et al., 2020).

6.3.5.4 Assessment of mental capacity:

Attention to the service user's mental capacity, their ability to provide informed consent and understand their role in the study was considered. It was important to attempt to include patients who may lack capacity as understanding their thoughts and experiences of nutritional care was important for the aims of the study. If uncertainty existed, an assessment of mental capacity was undertaken in accordance with the Mental Capacity Act 2005 and GSTT assessing capacity toolkit (NHS Health Research Authority, 2020).

6.3.6 Patient and public involvement (PPI)

Patient and public involvement (PPI) activities were undertaken in the preparation of this study with three falls service users and one healthcare professional representing the study population. Feedback and piloting by service users helped refine the study documents, improve the language and terminology used, provide recommendations for recruitment and provided practice in conducting interviews. Similarly piloting with HCPs aimed at familiarisation with the interview process and refinement of the interview

topic guide. The study was presented at the Older Persons Unit multi-disciplinary research meeting at St Thomas' Hospital on 27/03/2019 for academic, clinical and practical peer review and feedback. Further details of adjustments highlighted by piloting with PPI members can be found in **Appendix 20.**

6.3.7 Data management

6.3.7.1 Participant and researcher wellbeing and assessment and management of risk

Participant: No risk was anticipated to the participants because research activities carried out in this study did not involve an intervention. The service users were however, recruited from the older adult population where there is a high likelihood of long term conditions and co-morbidities that might impact a person's physical or mental stamina (e.g. diabetes, cognitive issues, COPD). Participants were reassured that if they felt distressed during the interview, the interview may be paused or terminated if required and there would be no pressure to continue. Participants were offered the option to reschedule if requested. Research activities were not anticipated to interrupt or disrupt clinical care, however, if the HCP or service user believed that the research activities were interfering in any way the interview was to be suspended immediately and only continued if or when appropriate. Participants were informed in the information sheet and verbally during the interviews that they may choose to withdraw from the study at any time without providing a reason and that this would not disadvantage them in any way.

Researcher: Potential safety risks were considered when travelling to patient homes to conduct interviews. The code of Practice for the Safety of Social Researchers or Scientists Working Off-Site (KCL) and GSTT's lone worker policy.

To develop relevant theoretical knowledge and practical skills, the lead researcher attended training in conducting interviews prior to study commencement. Additionally, all relevant mandatory training policies (e.g. safeguarding policy for vulnerable adults) at the Guy's and St Thomas' NHS Foundation Trust were followed.

6.3.7.2 Confidentiality

Participant confidentiality was maintained in accordance with the new Data Protection Act 2018 (includes GDPR), NHS codes of practice, Good Clinical Practice and Research Ethics Committee Approval under the supervision of the CI (supervisor, CEW). If interviews were conducted at the patient's home, or when travelling between hospital and community sites (e.g. HCP interviews), travel was minimised. After the interview, the researcher (MD) returned directly to university or trust premises for the immediate and appropriate handling and storage of sensitive data.

Each participant was provided with a unique study identification number during the consent phase. This was used throughout the study and was kept separate from any personal identifiable data collected (key link) secured within KCL premises. Transcribed interviews were pseudo-anonymised ensuring not to use participant identifiable information such as name or location and kept separate from the key link. For data analysis and future publication, all data were analysed and pseudo-anonymised (e.g. quotations) to ensure patients or HCPs could not be identified from the data or quotations.

Informed consent procedures were in place to ensure participants were aware of their involvement within the study and study procedures. Details of participant identifiable information including names and addresses, were only available to the research team during the project and then destroyed at the end of the project (unless participants had

consented to future contact). To reduce the risk of identification, patient-identifiable data requiring detail for scheduling interviews and health record access (e.g. name, contact detail, post code, and NHS number) were entered on a password protected database on a university or trust computer and accessed only by the lead researcher or designated member of the research team (e.g. CI). Interviews were audio recorded on an encrypted audio recorder and filmed using a video recorder and both securely transferred to a password protected server within KCL or GSTT. Following study closure, all data will be archived at the sponsor site (GSTT and/or KCL) and held for 5 years in accordance with Trust and GDPR policies.

6.3.8 Data Analysis

Data collected were entered into Microsoft Excel version 15.34 (Microsoft Corporation, Redmond, Washington) spreadsheets and NVivo 12 software (QSR International Pty Ltd. (2018) NVivo, Version 12). Participant recruitment data, including the recruitment log, characteristics and checklists throughout the study process (e.g. consent at each stage), were held within a password protected Excel file (password not shared with anyone). The data collected from HCP audio recorded interviews and service user and carer filmed and audio interviews were transcribed by MD. Identifiable data within the transcripts such as names and health conditions were redacted. The NVivo software was used as a data management tool, and thematic analysis of all interviews was conducted using the thematic process of (Braun & Clarke, 2006). HCP, service user and carer interviews were triangulated to identify shared and cross cutting themes. MD attended internal and external training on qualitative data collection and analysis to gain an understanding of the methodology and processes.

The steps of the data analysis framework were as follows:

1. Thematic analysis:

Thematic analysis based on the process by Braun and Clark 2018, begins with (1) familiarisation with the data, followed by (2) generation of initial codes, (3) searching for themes, (4) reviewing themes (5) defining and naming themes and (6) interpretation and reporting, in an ongoing cycle. This was an iterative process which assessed sample size and data adequacy throughout the data analysis process to reach theme saturation (Guest et al., 2006; Vasileiou et al., 2018). Transcribed interviews were coded to identify and categorise themes highlighting participants' experiences and perceptions of nutritional care by myself. Transcribing the data allowed for familiarisation with the interview scripts while listening to the audio and watching the films, and additional notes were written on the side as needed (e.g. tone of participants). Codes were named and defined. Understanding how to generate codes was guided by (Auerbach & Silverstein, 2003). Coding and identification of the themes were first conducted separately for the HCPs and for the service users and themes identified for each group.

Rigour: To increase the rigour of data analysis (Morse, 2015), a second independent researcher (TD) with qualitative experience and one supervisor (CEW) independently analysed a proportion of the interview transcripts (10% of transcripts each). This resulted in validation of the codes and themes, which were written up and discussed during two research meetings.

After interviews were completed, discussions were held with the research team (supervisors and independent researcher who had many years of clinical and academic experience) to reflexively discuss the themes and challenge interpretations. During these discussions, the codes of the individual HCP and service users clearly identified parallel themes between the two groups. Subthemes were then created to represent

overall "shared" themes from the HCP and service user interviews. Additionally, data from two questions from the HCP interview topic guides (*Can you tell me about your profession and your role within the falls clinic and other falls services? Can you tell me about our experience of nutritional care in your practice*?) provided information on the structure, falls service pathways (e.g. descriptions of the rehabilitation options) and nutritional activities performed and the roles of the HCPs. These data were used to understand the overall context of the falls services. An example interview transcript and coding process can be found in **Appendix 21 and 22.**

2. Identifying and validating touchpoints

In parallel with the coding process, specifically within the first round of coding of service user interviews, "touchpoints" as crucial moments which resonated within service user's journeys firstly identified from the codes by MD. These touchpoints were validated individually in a second meeting with the service users to review the video clips, the transcripts (for any additional information), and discuss their final thoughts on nutrition and improvement priorities brought out in the preliminary themes (Birt et al., 2016). Any additional information was documented to consider within the analysis. This process of member-checking, ensures the data from the narrative interview is an accurate record of the interviewees perceptions and experiences (Birt et al., 2016). The touchpoints were ranked with the researcher in order of importance, for which touch point portrayed their experiences and any additional notes taken. These touchpoints and improvement priorities were framed alongside the themes, highlighting where these crucial moments for nutritional intervention fit in relation to the themes identified. Informed consent was taken again

at this stage from the patient and carer participants to approve the release and use of the film for future group discussions (2).

6.4 Results

6.4.1 Participant Characteristics

Healthcare Professionals

Fourteen HCPs were interviewed across the outpatient and community falls services. The characteristics of the interviewed HCP participants are shown in **Table 6.2** and varied in years of experience and professional background (medical, allied healthcare, and therapy instructors and assistants), as would be representative of the falls services. Physiotherapists and occupational therapists interviewed included those on rotation within the outpatient and community falls clinic and the AHP manager or specialist. Additionally, within the community, the postural stability instructors and the therapy assistants involved in the delivery of the strength and balance and community exercise classes were interviewed. Interview durations ranged from 13 to 60 minutes.

Service Users and Carer

The characteristics of 13 service users and one carer recruited for interviews are presented in table 6.2**.** In total 60 service users were approached at the falls clinic for recruitment between August 2019-February 2020 of which 13 participated in the interviews, while the remainder declined to participate in the study or could not be reached for scheduling (n=43). The duration of service user interviews ranged from 22 to 60 minutes. Six interviews were held in a private room at the OPAU falls clinic, four interviews were held at KCL, and three interviews were conducted at the service users' own home.

Participant age ranged from 58-88 years. Two of the 13 participants interviewed were males and most service users were White British. The boroughs of Southwark and Lambeth are diverse in ethnicities (e.g. Lambeth: 40% white British; 11 of 25% Black

African) and among the older age groups within these boroughs, the females are significantly greater than the males (Lambeth Council, 2016; Office for National Statistics, 2011; Southwark Council, 2021). The carer interview was conducted jointly with the service-user interview. Narratives from all 14 participants were used within the thematic analysis. Eleven service users consented to video-filmed interviews, with nine validating the touchpoints and consenting for their clips to be used within the trigger film. Unfortunately, because of the COVID-19 pandemic, two video interviews were pending validation for their touchpoints, therefore only quotations were used within the film (not included in this thesis).

Table 6.2: Characteristics of interviewed participants (n=28)

Healthcare professionals (n=14)	**N%**
Location	
Outpatient HCPs	8 (57)
Community HCPS	6 (43)
Profession	
Consultant Physician	2 (14)
Nurse	3 (21)
Physiotherapist	4 (29)
Occupational therapist	3 (21)
Therapy assistant or instructor	2 (14)
Years of Experience	
≤5 years	5 (36)
5-10 years	2 (14)
≥10 years	5 (36)
≥20 years	2 (14)
Service Users and Carer (n=14)	
Age (n=13)	
55-60 years	1 (8)
60-70	3 (23)
70-80	4 (31)
≥80 years	5 (38)
Gender	
Female	12 (86)
Male	2 (14)
Ethnicity	
White British	9 (64)
Black British	1 (8)
Caribbean/Jamaican	2 (14)
Nigerian	1 (8)
European	1 (8)

HCP: healthcare professional

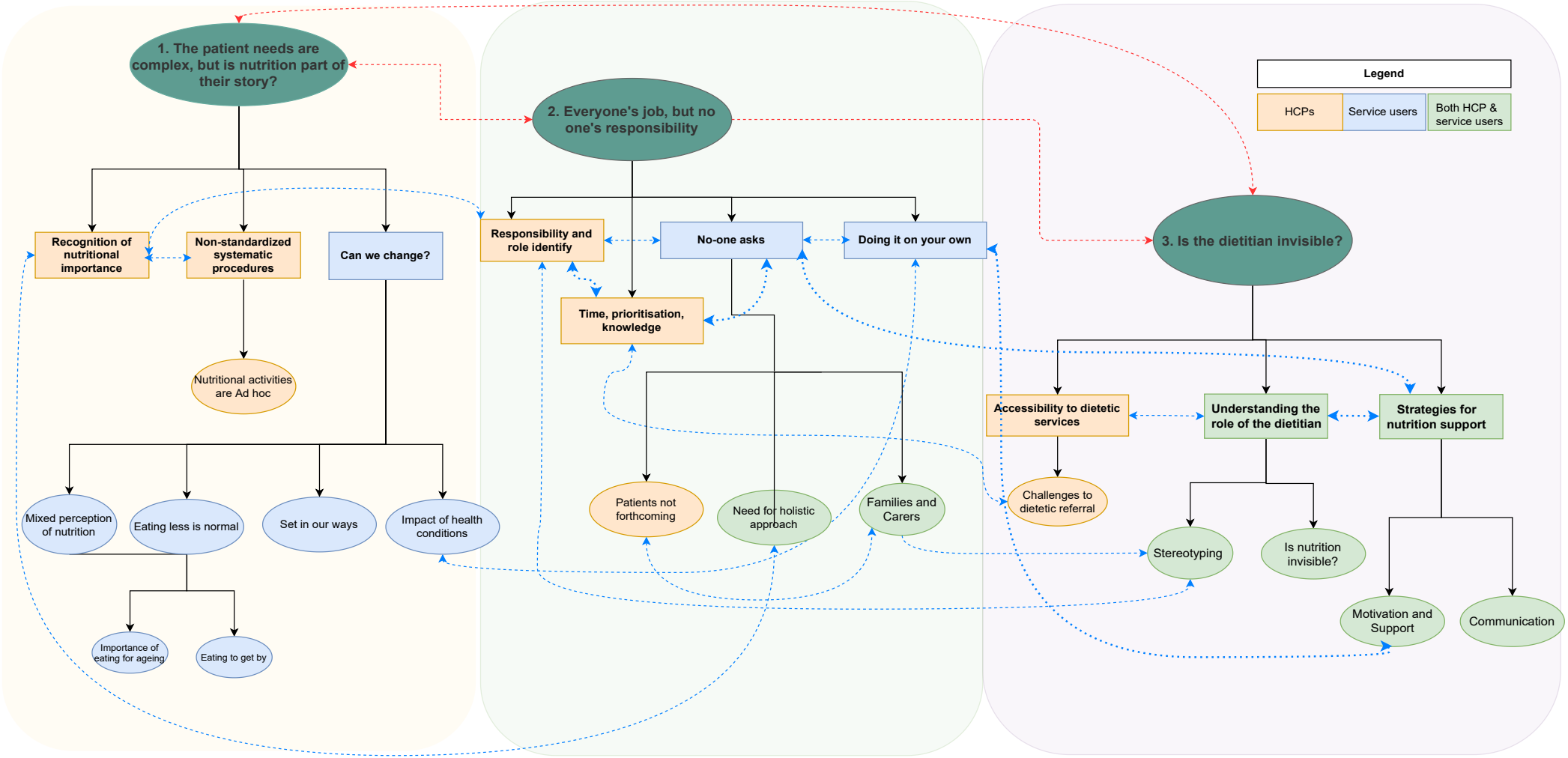


Figure 6.1: Thematic map of HCP and service users' shared themes

6.4.2 Shared HCP and service-user themes

The key findings on the perceptions and experiences of nutritional care of the HCPs, service users and carer are presented under three shared overarching themes consisting of eight subthemes (**Figure 6.1**).

(1) Patient needs are complex, but is nutrition part of their story?

The first overarching theme describes the perception that older peoples' health needs are complex while highlighting that nutrition is often not seen as one of the causes or solutions to these needs.

1.1. Recognition of the importance of nutrition within service users' healthcare journeys

All HCPs acknowledged the importance of nutritional care within the older person's care plan and described the importance of embedding nutrition as part of the 'holistic' MDT approach within falls services.

> *"… it's part of their complex story, yea……. I mean, generally speaking in geriatrics, as in apart from diagnosing and treating the acute and the chronic medical problems that you pick up, the mainstay of therapies are exercise and nutrition, those interventions. So, in terms of treating frail people and people who are near sort of homeostatic thresholds of like cognition and mobility in falls, then you know nutrition is one of the only few things we can do really."*
>
> ***[S8, consultant]***

One consultant also highlighted the role for nutrition and its 'emerging evidence base' as part of supporting strength and balance interventions.

> *"…I guess my sort of perception is that there is an emerging evidence base of the need to support strength and balance interventions with adequate nutrition…so, if I say that the main intervention is related to strength and balance and physio then I'm aware that then that does need to be supported by nutritional aspects of it…."* ***[S8, consultant]***

While nutrition was recognized as as part of health, HCPs also recognised poor nutrition as a key part of deterioration. HCPs, specifically PTs and OTs acknowledged

a cycle of decreased appetite, eating less and subsequently losing weight was common among the falls population.

> *"…their appetite tends to get reduced, so they're eating smaller meals, so they're kind of gradually starting to lose weight and get weaker, and then with this weakness they seem to get more fatigued and then it goes into this cycle of 'I'm tired, I don't want to eat…"* ***[S10, occupational therapist]***

This downward spiral in nutritional status was perceived to be affected by different patient-specific factors, for example the presence of dementia, poor denture care, or access to food as highlighted by two occupational therapists below.

> *"…so, they're not actually getting a balanced diet so that links to kind of sometimes denture care as well, it's harder for them to chew and stuff, so they and then if they've got dementia as well or a cognitive impairment so actually remembering to eat as well…"* ***[S10, occupational therapist]***

> ***"…****a lot of them don't have access, or have easy access to go out and get to shops, so I would say 90% of my cases aren't able to get out of the house, unless they got family who can bring them food, that is a massive barrier, and then you have people who have food at home, just being able to get up and manage in the kitchen and be able to get food themselves…"* ***[S14, occupational therapist]***

Some PTs and OTs reported they were aware of how poor nutritional status adversely affects patients' "abilities to carry out day to day activities", health outcomes and engagement with exercise and rehabilitation.

> ***"****…the case I have seen where people are malnourished, unless that is reversed it massively affects their health outcomes. I can think of particular patients where that was the case in terms of malnourishment and actually did not have the energy or anything to engage in any sort of rehabilitation until that was addressed and that was with sort of support…"* ***[S15, physiotherapist]***

Similarly, among service users' some participants also described nutrition as an important factor for their health and wellbeing. This included being conscious of their eating habits as they aged and being 'sensible' with their food choices.

> *"…I think about what I am eating much more, so as not to eat junk food or anything like that, no I think I am horribly sensible about eating…"* ***[P15]***

These individuals had a positive outlook on nutrition as an important aspect of ageing, for living longer, staying healthy and avoiding diseases associated with age such as dementia.

> *"For me now its most important, because if I don't have a good nutrition plan, then my body will deteriorate…"* ***[P12]***

> *"…as you read up on things you realize as you get older there's more chance for you to get dementia and stuff like that and diet is supposed to help with anything like that, and I think that's where I'm a bit more conscious about you know when you're younger you don't think about it and it doesn't seem to matter but as you get older it does."* ***[P5]***

1.2. Nutritional needs not formally addressed using systematic procedures and pathways

While nutritional care was recognized by HCPs as an important factor within the service user's "complex story", the nutritional activities performed within the falls services did not follow formal procedures and pathways and were usually undertaken on an ad hoc basis. As described above, the multidisciplinary team in the outpatient and community falls clinic used a "Proforma" for the comprehensive geriatric assessment (CGA) of a patient. Questions within the Proforma include: *are you losing weight?* Nurses primarily asked these questions and described usually asking these questions in a 'conversational' manner.

> *"...through that conversation of weighing and when they say 'what's my weight?' or 'I've lost weight?' and then we sort of integrate the screening tool of questions, the screening questions for the MUST score, so have you*

had, how long have you think you've lost weight…we sort of deal with the MUST screening tool as conversation…" ***[S4, nurse]***

Within the PT and OT assessments, questions relating to the activities of daily living include the patient's ability to cook or prepare meals. All HCPs reported that nutritional screening questions within the Proforma and the activities of daily living (ADL) checklist were used to flag or prompt discussion around any nutritional issues. However, dietetic referral from both the outpatient and community settings was reported as rare.

"It's to make sure kind of that it is flagged to the dietitian or to the consultant and discussed as well, because there might be a reason, and that might have been known, there might kind of be a reason why or might prompt of having further medical investigations or actually is there something…" ***[S11, occupational therapist]***

One HCP reported often forgetting to ask these questions. Depending on the patient's response, such as if they were losing weight, HCPs may then probe further to ask about their diet. Additionally, these questions were not formally structured and were not perceived as essential to be asked of all patients.

"*if something comes up on the nutrition bit about the loss of appetite, we probably ask a few more questions but we don't* really *then do anything with that information really."* ***[S10, occupational therapist****]*

Overall, nutritional activities were not standardized, they were not always performed or there was no follow through with the outcomes.

HCPs recognized that the complex needs of this patient population resulted in patients' health journey crossing many care boundaries e.g. from hospital to discharge support service and then care in the community. The community was identified as a key setting for both flagging and monitoring nutritional problems as well as providing opportunities for appropriate care and health promotion.

> *"…it might be good in the community because you can go a few times to people's homes- they might be comfortable in their surroundings as well there is less distractions, you can kind of follow up over a few weeks as well rather than- in terms of discharge planning in a matter of days…"* ***[S11, occupational therapist]***

Some HCPs reported providing general nutritional advice which was based on general knowledge from experience or looking up guidelines (such as hydration), described in detail in the next theme. Community exercise classes and strength and balance classes were identified as opportunities for risk identification and possible nutritional education by therapists and consultants, and were recognized as key targets for the prevention of further nutritional and functional decline.

> *"…providing information on diet and nutrition which obviously patients are exercising more than they would routinely because they just started an exercise class, so that would be a good time to provide some information."* ***[S14, occupational therapist]***

1.3. Can we change? Perceived potential for change

Service users' perceptions and experiences of what nutrition encompasses, the changes affecting their eating habits through the course of their life, and their perceptions of changing their habits ranged along a spectrum described within this sub-theme. Mixed views were described relating to their health beliefs and the potential role of nutrition. While some service users define and perceive 'nutrition' as important for their wellbeing as highlighted above, in contrast other users viewed nutrition or eating as solely a means for survival. Similarly, at one end of the spectrum, some service users described their age, underlying health conditions or the need to take medications as impacting their nutritional habits while at the other end, others described no impact of age, lifestyle or health on nutrition.

1.3.1 Mixed perception of nutrition

Service user perceptions of "nutrition" were very mixed. For example, some associated the term "nutrition" with "sugar, sweets, and obesity". At the same time, there was limited awareness of the potentially adverse effects of eating less, appetite loss, and unintentional weight loss.

> *"I like fish but the other stuff about cutting out like sugar, you know lots of sugar and fat …I don't eat an awful lot of fat though you know…" [**P5**]*

1.3.2 Eating less is a normal part of ageing

While the role of nutrition in health was perceived as important by some service users, eating less was perceived as an inevitable part of ageing by some individuals. Decreased appetite and eating less than "they used to" were perceived as normal parts of the ageing process.

> ***"**No, I don't I can't pinpoint anything, I think it is just a phase that you gradually don't eat as much as you used to… most of my friends are 10 years younger than me, so their eating habits I suppose are probably a lot better than mine and they can't understand why I haven't got such a big appetite as I used to and I think that comes with age...**" [P10]***

Most individuals described how when they were younger, they would eat a lot but now they eat less. Decreased appetite and reduced intake were not perceived as negative, rather service users perceived these as the norm.

> *"I am aware that I ought to, I used to eat sort of 1-2 -three meals a day and nowadays I tend not to eat breakfast and then I have lunch and then I have tea and supper. Unconsciously, I know it's better for you really to eat 3 times a day properly but I've got out of the habit." **[P5]***

> *"Probably, well I'm not eating such big dinners, definitely not, I think as you get older you just don't want big dinners, well you know I do cook and I eat and I am satisfied, I don't go hungry I definitely don't go hungry…" **[P11]***

1.3.3 Set in their ways

Additionally, for some, eating less also linked to the potential for changing their habits, where individuals described being "*set in their ways"* with no desire to change

their routines. Translating this into the context of nutrition and eating habits, individuals recognized that it is hard to change older people's nutritional behaviours because they are already fixed in their habits and don't recognise the need or reason to change or the potential health benefits of changing their eating habits.

> "*To continue, because it is hard at this age to change elderly people because we are set to our pattern, so the only thing is to advise us, to encourage us to eat sensibly and when to cook it, how to cook it, that type of thing, like now I won't change my way of eating, not because I don't want to, because I don't see the reason at my age now…"* ***[P13]***

Other service users perceived nutrition solely as a means to survival, without a focus on nutrition as beneficial for health outcomes.

> *"Well, you have to eat to stay alive, if you don't eat it's like drinking, isn't it?"* ***[P8]***

They described being used to their lifestyle and perceived little potential for changing their eating habits. Also, they didn't equate adequate nutrition with good health and did not think that changing their eating habits had the potential to improve their health.

> *"…it's just getting I mean you used to hear, you used to, when I was working you were used to certain times for your meals but now I'm retired and I just have it when I am ready I suppose or when they cook it, I don't rush them, I just…no I don't keep to a certain time for lunch or whatever, I just get it when I get it…you know…"* ***[P14]***

While some service users described how ageing had affected their eating habits, others reported that they had no age-related health concerns and felt their nutritional habits had not changed as they had grown older. While people reporting this perception had a positive view of the importance of nutrition in improving health, they too felt that there was no need for change and were set in their ways.

> *"No, in terms of my diet nutrition and intake if you like, there's not really been any change at all, I don't, the thing is I go out every day, despite the fact that I got a rather nasty injury to my back, I still manage to get around, I*

still manage to walk as well as I can, I still manage to do exercises…I suppose if you were bedbound or something, then you are not using any energy so your intake would probably go down, but my intake is the same as it was 40 years ago." ***[P6]***

1.3.4 Impact of health conditions

Several service users described how long-term health conditions or recent health issues (e.g. diabetes, rheumatoid arthritis, impaired vision, or a recent fall) had affected their eating habits or ability to cook and prepare meals.

For example, decreased mobility was a factor that affected the ability to prepare food.

"No, I don't know, I don't know why…when you are younger you've got more energy to stand cooking, when you are older you're not, because when I was young sometimes I get pain in my neck when I'm leaning washing up…" ***[P8]***

Others reported that a new diagnosis with a health condition or co-morbidity resulted in them struggling to understand the disease and what is needed to make nutritious choices.

"*But since having been diagnoses with diabetes right and you, it's instant you have to change everything they tell you on Monday at 12:00 and by 1:00 everything changes…"* ***[P12]***

Some individuals discussed not having the energy (due to fatigue or pain) to prepare food or make an effort with daily activities, including eating. Additionally, for some the struggles of losing weight (e.g. if overweight) were also mentioned as affecting eating habits. These complex elements are described by a female service user below:

"I think I eat quite well, I do feel it is a bit of a struggle sometimes because… I don't know maybe this is something everyone feels no matter what their age or their health…you think 'oh what am I going to have for supper'…sometimes the effort involved in planning, shopping, cooking, cleaning up, seems more than I can manage on a bad day…my health, my sense of wellbeing fluctuates quite a lot, like I guess a lot of people with

chronic issues and long-term medication use, and on bad days you really don't want to be bothered…" ***[P4]***

Losing independence and the need for help from carers or relatives for assistance with shopping and cooking was also reported to influence food access and impact nutritional habits. This resulted in low motivation in some service users and one carer. These individuals reported that cooking and preparing meals for themselves was a high priority and helped them to remain independent.

"Well I was an active person, you know I go shopping and do what I can you know, but now I find it a bit difficult to go shopping alone and need family…" ***[P16]***

"*Well it is part of life, it is important, it is important, when somebody cook[s] for you it is different than when you cook for yourself definitely."* ***[P13]***

Furthermore, service users identified social situations such as isolation and living alone, family or engagement in social activities (e.g. clubs) as playing a role with eating well and maintaining health. Individuals who mentioned a support system such as dining with family, described it as having a positive influence on their nutrition and health. Social activities such as eating lunch with friends were perceived as positive influences on nutritional habits and coping strategies.

"… we go to this club and we talk about our health and all different things and that, and I'll say what did you have for dinner last night, we're in the same boat, most of the ladies are widows like myself, when you are cooking just for yourself, like I say I got <daughter's name> she's only a minute around the corner from me and I go there quite a bit especially weekends and that and she takes me out for a surprise meals and that…" ***[P11]***

For some, being alone or losing a loved one resulted in a decline in motivation for basic activities such as food preparation and enjoyment of food.

"…I don't eat such big dinners as I used to like when <husband's name> was alive" ***[P11]***

> "*Food was good years ago…you have children, so you are cooking for them as well……..well when you are living on your own you don't cook like you used to, not when you get older…*" ***[P8]***

Additional some individuals mentioned how being brought up during World War two had influenced their eating behaviour. This is highlighted by one individual describing the changes in nutritional needs and the realisation that early influences of food may no longer be appropriate.

> "*When I was a child we had a lot of things like puddings, meat puddings and potatoes, everything was very, very filling and cheap because that was situation, we couldn't really afford to do much else. That's how it went on really, I suppose, right up until I was in my late 20s, 30ish, when I suddenly realized 'oh we are not supposed to be doing all this'…*" ***[P7]***

There were also mixed behaviours regarding those who monitor their weight and those who don't view weight gain as a cause for concern.

> *"Well I think not so much the weight, 'cause I don't really mind the weight so much 'cause I think that's exercise …"* ***[P5]***

> *"…It's just something that as you get older, I think you need to be more careful because obviously you have more health problems as you get older, unfortunately so it's really even more important not to gain too much weight because your body can't cope like it used to …"* ***[P7]***

(2) Everyone's job but no-one's responsibility

HCPs and service users both discussed whose responsibility it was to initiate discussion of nutrition in a healthcare setting.

2.1. Responsibility, experiences and role identity

The responsibility for patients' nutritional care remained blurred for HCPs and service users. Most HCPs acknowledged that nutritional care is "everyone's business" and a shared responsibility, specifically within the falls services.

> *"I guess it's an MDT approach, isn't it? In the hospital and in falls clinic it is our responsibility in identifying what is going on and the reasons for that. Is it an environmental reason, so something to do with the home layout that*

they're not getting the nutrition they need? Is it because of cognition? Or is it that they just might not know enough about it as well?" ***[S11, occupational therapist]***

Yet, at the same time while acknowledging that nutrition was important, no-one specifically took responsibility for performing nutritional tasks such as screening and assessment.

"Yea, but then the problem with that is that its everyone's business is nobody's job…" ***[S9, physiotherapist]***

Nurses were identified by themselves as well as by other HCPs as responsible for performing nutritional screening however, nurses also felt that any member of the MDT could help identify if there is a nutritional need.

"I would have expected it more to be nursing, just because they monitor weight more and other things like that, they might have, that is more that is kind of on their radar…" ***[S15, Physiotherapist]***

As a consultant-led falls clinic, some AHPs also highlighted the responsibility of the doctor to highlight nutritional needs.

"At the moment I would probably put, it depends, overall, in particularly in falls clinic on the doctor, because its primarily under his care, but I think it's part of all our roles to be picking out these things and highlighting it, but I think that to me at the moment, because we don't have a nutritionist, it would come under the doctor's…" ***[S5, physiotherapist]***

Outpatient and community OTs and PTs had similar perceptions and discussed how including nutritional care in their role would be an additional activity that may be outside of the scope of their roles. Some perceived that adding nutrition would result in leaving out another assessment component for which they were more suitably trained.

"I mean I think it can always fit in and it's just how far you go and to what degree, it is quite easy to give some maybe some basic screening, basic advice, understanding just how much we are putting aside to sort of integrate

the two from that point of view…yea I think there is always a role but it's difficult because there are so many other for example disciplines…" ***[S15, physiotherapist]***

HCPs with more experience described what they felt able to do within their roles. For example, one experienced OT felt that they asked enough questions to warrant a dietetic referral and wouldn't feel the need to go deeper.

"I feel we ask enough to do, to warrant that onward referral, I don't know if would want to go much more in depth…" ***[S10, occupational therapist]***

One PT highlighted that the different professions all concentrate on their own roles, resulting in no-one focusing on nutrition.

"…obviously the doctors are more concentrating on the medical stuff, the nurses are concentrating on care, I just want to get them walking…" ***[S5, physiotherapist]***

Similarly, a community nurse highlighted that given the complexity of the population, nutritional activities require a specialist in the field (dietitian), rather than other AHPs.

"…I think that the dietitian should be the first person, if not then the doctor could ask questions, but I think that they go through so many things that I think a specialist should be the person to see the patients." ***[S7, nurse]***

While the importance of nutrition was echoed by the AHPs, a postural stability instructor highlighted that he is not a 'trained' dietitian when it comes to performing nutritional activities.

"To be honest, we are not trained dietitians we just read the importance of a dietitian…" ***[S12, postural stability instructor]***

Overall HCPs, specifically physiotherapists, occupational therapists, nurses and community instructors, described themselves as having a role for advocating good nutrition and promoting the role of the dietitian. Understanding the value of the role

nutrition plays within falls services and raising awareness and practice among staff was highlighted by a consultant.

> *"I think knowledge…of the staff doing it, that sort of value of nutrition in falls…and then also…as I say the leaders of the service do make sure they are aware and are operationalizing the people who need to do the assessment scores to do it…"* ***[S8, consultant]***

Nurses described their role in identifying at-risk patients through nutritional screening.

> *"we're the ones who I feel might catch patients who might be malnourished, because they come from the community or they've been referred from other disciplines and they are kind of picked up by us by asking these questions."* ***[S7, nurse]***

However, one nurse also highlighted the limitation of their role as non-specialists. This was also echoed by other HCPs, including occupational and physiotherapists emphasizing their roles as 'flagging' nutritional concerns and then 'signposting' for specialist input or intervention, but not going any further.

> *"the main thing that we've done is get them in and weigh them, all we can do, because we are not specialist in it……then we either get them back to weigh them and ask the GP and flag it up with them."* ***[S17, nurse]***

This also highlighted their perception of their role as gatekeeping and checking a nutrition question off an assessment list. The falls clinic was also highlighted as a 'triage' and one-stop shop for screening complex patients and onward referral if required. This highlights the perception of prioritising other factors over nutrition unless nutrition was 'marked' (e.g. evidence of significant weight loss).

> *"…it's kind of a general screening, because all clinic really is, falls clinic is a screening, a triage…well yea it's kind of like do they need physio, do they need OT, do we need to refer them to anyone else if they need support, is there something the doctor needs to refer on for further assessments or refer back to the GP..."* ***[S17, nurse]***

2.2. Lack of time, prioritization and knowledge

Lack of time was often described as a barrier to prioritizing nutritional care. This was attributed to limited time during patient consultations when there are several other 'screening' activities to complete as part of the assessment process (**appendix 23**). Joint physiotherapy and occupational therapy consultations lasted approximately 45 min.

> *"It's part of our initial assessment, I don't think, if I'm entirely honest I'm not sure anyone is particularly good at asking questions about it, because there is so much time pressure…"* ***[S9, physiotherapist]***

Questions related to nutrition were considered triggers which might prompt further referral or exploration of the issues.

> *"but we do ask questions that are almost like trigger questions, so 'do you have any concerns about your appetite?', 'are you finding it easy to prepare meals?' and then we can sort of triage people, we can refer to the dietitian, we can refer to the community dietitians, we can refer to the OT if the reason they're not eating is because they're having trouble like opening jars what they need to make their meals, we use it as a trigger to ask more questions."* ***[S9, physiotherapist]***

The length of the community dietetic referral forms was also reported as an issue that might have time implications.

> *"…the length of the community referral form is off-putting for when you are in a busy clinic and don't have the time and afterwards you've got to get everything done within that short space …"* ***[S10, occupational therapist]***

The lack of prioritization resulted in nutritional activities such as nutritional screening or assessment not being performed routinely or followed up. HCPs described limited knowledge and a lack of confidence and resources in providing nutrition-related information and perceived these limitations, as well as the lack of time, as affecting what can be pursued nutritionally within their professional roles.

> *"…we've got like this massive assessment form and it's kind of like, how far do I delve… I don't think I would have the knowledge to go much further or*

even if I knew the questions it's kind of knowing what to do then with the answers." ***[S10, occupational therapist]***

Perceptions varied among the HCPs with greater experience than the junior HCPs. Junior HCPs expressed an enthusiasm for nutrition to be addressed among the older population, however they described a lack of confidence in their own knowledge to bring up nutrition as an issue during an assessment.

"I guess I haven't had that much training on it, so it would just be more common-sense type stuff I don't think there is anything I specifically have been taught as such about nutrition…" ***[S14, occupational therapist]***

On the other hand, experienced HCPs were more comfortable pulling nutrition in as part of their assessment, such as through flagging and discussed the nutritional knowledge gained based on their experiences:

"…And also from previous experience, I've worked in a different unit that worked with HIV patients and a lot of it was around weight loss and we've done a joint management with the dietitian and physio so I've worked with the dietitians and picked up a few things from them, through experience but I wouldn't imagine that someone who hasn't had any experience would feel comfortable in giving advice." ***[S9, physiotherapist]***

AHPs specifically described not going beyond what they have done in their training or based on their experiences when discussing or identifying nutrition, which may suggest limitations in nutrition-related training.

"I wouldn't feel comfortable to give them, I would give them baseline advice, I wouldn't feel comfortable to give them more information than what I know about nutrition, what I've done in my training around nutrition and wellbeing…" ***[S7, nurse]***

This was also discussed by a therapy assistant involved in the community exercise class. In the community, both the therapy assistant and postural stability instructor (PSI) reported that they lacked confidence in providing nutritional information, while

also highlighting their role within the group classes is well-placed to involve nutritional care. One PSI described not being in a position to provide nutritional information and reported they would recommend the individual to seek advice from their GP.

> *"I think that all of my knowledge about nutrition is superficial but if I want to apply it to them, because I know it should be part of me telling them, but I think before I can do that I need more knowledge so it is really difficult for me to advise something that I'm not really you know I'm not really expert with so…"* ***[S13, therapy assistant]***

The overall lack of knowledge also contributed to the ad hoc and missed nutritional activities performed as mentioned earlier, where nutritional screening or 'trigger' questions were performed, however outcomes of the nutritional screening were not followed through (e.g. score not recorded in health records, no dietetic referral), which may be a result of the limited knowledge of the nutritional care procedures.

> *"I think it's actually really overlooked, and I think it really shouldn't be overlooked, and that's why I thought, or struggling to think, cause I do think apart from that very basic section in our Proforma, I don't have conversations with people about it, it's not highlighted, I think it does have a massive impact on patients…"* ***[S5, physiotherapist].***

2.3 No-one asks

The lack of clarity in the HCPs' roles towards performing nutritional activities also transferred into the service users' healthcare experiences. Service users recognized that nutrition was rarely brought up during healthcare consultations.

> *"I've never been weighed at the <> clinic, I've never been asked about my weight…"* **[P8]**

> *"Well the doctor doesn't ask…"* ***[P13]***

Service users perceived that there was not enough time to address nutrition and consultations were rushed.

"I suppose it's thinking it's not really important, it's not kind of serious and therefore you think you're wasting peoples time…" ***[P5]***

"…I do feel very much that I don't really want to bother them with something that's not on their agenda…" ***[P4]***

Additionally, the second barrier to bringing up nutrition during consultations was that service users perceived that nutrition was not an important topic to discuss. For almost all service users, this research study was their first time discussing nutritional care.

*"…I mean this is the first time I've spoken about nutrition within the healthcare service…****[P6]***

The need for bringing specialties together for a holistic approach and discussing nutrition as a fundamental component of health during a consultation was described. One participant discussed how it was important to be viewed as a 'whole' during health evaluation, with nutrition part of this [P4]. The role of nutrition was perceived as 'separate' and there was a lack of clarity surrounding whose role it was to provide nutritional support.

"I've got a few very different health issues and see different specialists, it's a complete lack of a holistic…an-holistic approach…the whole body…I see the <name of department> for my <name of condition>, and I saw the …go to the <name of unit> at Guys for those remaining issues, and my GP, and how that affects me with the falling and the <names of health issues> I've had…but…I haven't had anyone pull it altogether and look at me as a whole person and how I live and how I eat." ***[P4]***

Two service users described positive experiences overall with NHS services and specifically the impact of multidisciplinary healthcare. Specific to falls services, one service user suggested the potentially positive impact this would have on care if 'diet' was also included within the multidisciplinary appointment.

"It's funny because contact information certainly for the falls clinic is amazing, I mean I got a scan I had this I saw a physio all that sort of thing, so that was very impressive, so maybe if they did something like that for diet as

well, and again for the over 60s really because it's more important I think for us than younger people…" ***[P5]***

One carer described getting advice in the hospital in relation to the service user's diagnosis and found this helpful.

"…I went to a hospital last week about the diabetes, and then the gentleman, the doctor was really telling me what to eat and what not to eat and I think that was very good…" ***[P16, C1]***

There was also a mixed interest among service users in wanting to know more about nutritional care within consultations. For the service users, it was not clear within an appointment who should be responsible for raising nutritional issues during a consultation, the HCP or themselves. While some were interested to discuss this topic, the majority viewed it as the responsibility of the HCP to raise the issue.

"I would like to be prompted by the whichever healthcare professional I'm seeing and how about eating..." ***[P4]***

Participants described wanting to talk about weight and wanting someone to listen, however they felt there was no time to further burden HCPs. Nutrition was viewed as an important issue to discuss by one of the service users [P4] but time was seen as a barrier as highlighted earlier.

"I think it would be very useful… because, what you eat has such a big impact on how you live and sort of just ignore it is quite strange, I always feel very conscious, maybe this is just me, that the medical professionals I see are really under pressure and pressed for time and so I'm just managing okay so I don't bring it up." ***[P4]***

While another perceived nutrition as not an important topic to bring up when time pressed [P11]. In both cases, nutrition was not brought up by service users and the topic was 'buried'.

"…to be quite honest I think some of them are so busy it seems trivial for me just to say you know whether I am eating the right food or not, I'm quite

happy with what I have, I try and bury it, but yea I know that when I go to the doctor they try and want to know what you are eating, yea I try and be good, you know now and again I might slip up..." ***[P11].***

The theme of burying the topic of nutrition when it is not brought up and managing on their own was echoed by other participants such as [P13] below.

"... but I try to manage my life without shouting for help..." ***[P13]***

In contrast, some service users mentioned that if they were interested they would be confident to ask the HCP themselves (e.g. to elaborate on weight or meals).

"I think sometimes you've got to be the person who does that because we all have that 'I'm not going to ask' and so I think that's not the fault of the health professionals because they're very overstretched and all the rest of it." ***[P5]***

However, for some service users who would be confident to bring up the topic themselves, nutrition was either not of interest for them to discuss or they perceived they had no current nutritional problems.

"I wouldn't generally bring it up because there's not a problem as such, it's not something I feel I want to talk about because I want to solve some problem rather, however if I'm asked about it I'm very happy to talk about it, I think it's a very, very important subject, that we said before 'you are what you eat', so as much as healthcare professionals, doctors and nurses want to help you, you really do need to be aware of your own nutritional needs." ***[P6]***

Another service user described an interest in discussing weight however, doesn't bring up nutrition in consultations because she was used to her routine, as highlighted below. This was related to the behaviour described in the first theme, where some older adults were 'set in their ways'.

"I don't mind, it's nice to know that if I am not losing weight or if am losing weight, then you can probably say this and that or the other, but it doesn't worry me, as long as I don't lose weight, I am alright but ...it's the same old

thing I suppose you just get used to it, you get into a routine and you know…" ***[P14]***

From the HCPs perspective, service users were perceived as not forthcoming with regards to discussing nutritional status and habits. This was related to the perception that older adults do not recognize the link between poor nutrition and health outcomes.

"Yea I think a lot of people really aren't aware and probably not of the impact it has as well if someone is saying oh I am exhausted oh I'm really tired and don't really compare that to oh they're not eating that much at all, I don't think they would see that link…I think it is quite, it feels quite rare for somebody to say oh this is causing this…" ***[S11, occupational therapist]***

"Yea they kind of go, 'what do you mean?' 'It's fine'…but actually your weight isn't fine, you're actually very underweight……and they don't really seem to recognize the dangers of not only being overweight but being underweight. People still don't think…don't associate being underweight as being unhealthy…I think it would be really useful for them to be aware of what their limits should be and where they should be sort of sitting individually." ***[S5, physiotherapist]***

Discussion of nutrition in consultations from the experience of the HCPs was a result of prompting these questions. HCPs highlighted a reluctance among older adults to discuss weight or to be referred to a dietitian, which was perceived negatively. Patients were often perceived as resistant to change and reluctant to receive nutritional advice because they were used to their habits. This also links to both the complexities of the service user's perceptions of change discussed in the first theme.

"…a lot of people don't really want the advice a lot patients tend to look away almost, they kind of think, 'like oh I've been doing it for years and I feel fine'…" ***[S5, physiotherapist]***

A subcategory within this theme also highlights the role of families and carers. Some HCPs described families as more concerned with nutrition than the service user and highlighted that this should be included in the assessment process of a patient. Carers

and family members may help encourage discussion or referral to a dietitian when a service user is reluctant.

> *"I often find sometimes that its reluctant from patients to have that referral, and I think then sometimes encouragement from the family then they will often do it…"* ***[S10, occupational therapist]***

HCPs also reported that it may be difficult to get the story for a service user with memory impairment or dementia and carers are often the link to understand the service user's issues during an assessment.

> *"…Oh they need to be involved, it just won't be successful cause they are that link person, so if you have got someone, so the patients I have seen with dementia they don't have that understanding that they are not eating well, they are not recognizing and it is their families that monitor what the carers are doing…"* ***[S10, occupational therapist]***

2.4 Doing it on your own

For service users who felt they were not asked about nutrition during their healthcare journeys, the majority were 'doing it on their own'. They felt that they relied on themselves to look up resources for nutritional information or acquired nutrition information from their own experience or knowledge.

> *"I mean I would look up what I should roughly be doing…, as I say I don't tend to kind of go through things too much, because it is a lot of fruit, veg, common sense basically…you know cut out all the bad stuff and put in lots more of the good stuff…"* ***[P7]***

Sources of nutritional information included picking it up along the way, own readings, media, food-related hobbies (e.g. cooking, going to markets) or childhood experiences.

> *"Well I suppose I've picked things up as I've gone along, I mean I've only in the past I've known people who were good cooks so I've picked up ideas from them, since the advent of the internet there's you know a lot of information that you can get related to cooking and related to nutrition"* ***[P6]***

One participant described picking up nutritional information from the school she worked at, describing the nutrition meal plate.

> *"I've picked up these things from the school, they've got that plate and eat that many carbohydrates and all the rest of it. But also, different people and different things…"* ***[P5]***

Individuals with newly diagnosed health conditions, mentioned a 'struggle' to establish eating habits described in the category above (*struggles affecting eating habits*). For these individuals, a need for motivation was expressed and suggested strategies for support are described in the next section.

> *"It's okay to say to someone okay you are a <diagnosis> but you need to talk to them about the foods…it's just by chance I was reading something by the net and I saw that, but nobody talks to me about it, so it would be nice to give you a list of the foods that you can eat…"* ***[P12]***

Again, mixed views were expressed regarding seeking their own information. for other participants such as [P9] below, obtaining nutritional information on their own along the way was not seen as a negative issue, rather an assurance of knowing what is good or bad for themselves (*also set in their way*).

> *"Well I just think I just pick it up like everybody else, I mean you know I mean I've always been conscious of what's good food and not good food, and what to eat and what not to eat, which doesn't mean to say that I don't eat what I shouldn't eat, I have chocolate and things like everybody else (laughing), but I mean I do know what's good and bad for you…"* ***[P9]***

Most participants described seeking nutritional information because they liked to know "how much sugar" is in certain foods, where some information sought on their own may have led to some diet-related misconceptions.

> *"I really like to know things like how much sugar there is in apples and oranges and bananas and the rest of it, because you could I believe it's possible to eat too much sugar now which is why I wonder about the 5 a day (laughing)."* ***[P5]***

In contrast, service users who did not link health and nutrition reported they would not have brought up nutrition during consultations.

(3) Is the dietitian invisible?

3.1. Accessibility to dietetic services

This subtheme highlights HCP perceptions of nutrition and dietetic services, the perceived lack of communication between dietetics and other services and lack of knowledge about which dietetic services were available and how to access them. Furthermore, dietitians were often perceived as working 'solo'.

> *"…we have never had dietitians working with us it's always been kind of like in isolation"* ***[S10, occupational therapist]***

Several HCPs described the need to highlight dietetics as an essential service and suggested the multi-disciplinary approach of the falls service could increase the visibility of dietetics and result in improved integration and collaboration with dietetic services.

> *"…It's always going to be really positive in having a dietitian and having those discussions in MDMs because it can bring up a lot of ideas and questions that you haven't thought yourself, so again it's about using the MDT approach to kind of bounce ideas off each other have like more of a conversation, discussion about it…"* ***[S11, occupational therapist]***

There was a perceived need for dietitians to be more accessible to the falls service for example by, having a named dietetic contact or a 'hotline' to the dietitians. The lack of accessibility to dietetic services also contributed to the lack of knowledge regarding the role of the dietitian and procedures for referral. HCPs thought accessibility to the dietitian would help them to understand whether to refer a specific patient. The challenge of not knowing when it would be appropriate to refer to a dietitian was

described particularly among nurses and PTs in both the outpatient and community settings.

> *"I think even having a chat to the dietitians, because I don't know when a patient would be appropriate to refer to a dietitian to be honest. Like I know how to do it on EPR, it would be quite easy to do it, but it's not something I've never done or really thought of. "* ***[S6, physiotherapist]***

HCPs discussed several challenges with dietetic referral. Some expressed confusion around the 'grey area' of the criteria to prompt referral when a patient did not have a high risk MUST score or when there was no previous weight for comparison.

> ***"****...so I don't know what services there are for that pre-stage and there are quite a lot of the ones we get where they are just tinkering and so they might not be on that MUST score range per se, where you think they are going to be at risk and vulnerable in terms of their like nutrition…"* ***[S10, occupational therapist]***

A second challenge was not knowing the 'red flags' to prompt a referral, while trigger questions were part of the assessment forms, HCPs found it challenging to explore beyond these questions and know whether a dietetic referral is warranted.

> *"…some prompts of what we should be asking, a bit of guidance on that, should we be asking about appetite, is there any specific things that we should be questioning…"* ***[S6, physiotherapist]***

Furthermore, junior PTs and OTs described not knowing the process for dietetic referral or had not referred to a dietitian before.

> *"It's not something, I have, if I needed to I would probably ring up the GP or put it on the discharge summary, I would probably put it on the discharge summary to the GP to ask them to refer on to a dietitian, it's not something that I have done. If I was really alarmed by, I felt someone really urgently needed it, I would probably try and refer myself, but it's not something that I've done since I've been in this team."* ***[S14, occupational therapist]***

One nurse highlighted the electronic IT system within the Trust, which requires an extra log-in step to a second system for generating a dietetic referral. The process was perceived as a challenge or "double" redundant step rather than automatically generating a referral for someone with an at-risk MUST score.

> *"…with the system that we have got in our trust……I hope in the future, that once it triggers a MUST score of 2 it would automatically generate a referral to you guys, cause that is a double sort of two different systems not talking to each other, and you still need to go and find what are you referring for what is the weight what is the BMI that sort of thing."* ***[S4, nurse]***

Lastly, delays and a long waiting list to see a dietitian were also described as barriers by several HCPs.

> *"…say that we've recognized that a patient is malnourished and they need some advice from a dietitian, I think that it's really unfair and unfortunate that sometimes they are waiting so long, because of the time slot."* ***[S7, Nurse]***

3.2 Understanding the dietitian's role –HCPs and service users

This sub-theme describes the lack of understanding and stereotyping of the dietitian's role reported by both service users and HCPS. Theme 1 described the mixed views of service users regarding the importance of nutrition, which often translated into the perception that there is not a need to see a dietitian or the need for any advice to make changes. While some participants mentioned an interest in seeing a dietitian, it was never brought up during healthcare consultations, either by themselves or an HCP. Additionally, service users described nutrition as rarely discussed and few had ever seen a dietitian.

The perception of the role of a dietitian was not clear for many participants and their role was often stereotyped. One service user [P14] described the perceived barrier of

"cost" associated with a dietitian, due to the perceived notion of recommending changes to food choice.

> *"no, no you say all these dietitians all cost money, doesn't it, you have to go out and buy all these special …and I can't afford that on my bit of pension…"* ***[P14]***

Similarly, a nurse reported that service users and their families may be reluctant to be referred to a dietitian because they had the perception that the dietitian will only give food supplements, as highlighted below:

> *"There is this perception, that the dietitian will give us food supplements. We had a patient who luckily enough he had his son with him, and the perception was like, he doesn't need to be referred to a dietitian because he is eating his fish already, he has got his yogurt."* ***[S4, nurse]***

Some HCPs reported that some service users were reluctant to be referred to a dietitian.

> *"…if we have got concerns then it would be trying to see if they would consent for a dietitian to come get involved. I often find sometimes that its reluctance from patients to have that referral… "****[S10, occupational therapist]***

The lack of association between nutrition and health outcomes by service users feeds into the lack of awareness of the dietitian's role in the healthcare team. Some service users strongly associated nutrition with 'excess weight', 'fat' or 'sugar', indicating that they perceived the dietitian's role as solely for 'losing weight' if they had gained weight or were 'overweight'. This was also highlighted by a nurse below.

> *"…it seems like there is this mentality that if you've gained weigh then its bad, but for some if you lose weight its bad……. oh I've gained weight it's the cake, they blame the cake they blame the sugar…" [****S4, nurse]***

Additionally, HCPs echoed the lack of awareness of the role of the dietitian by service users, as described by a physiotherapist below.

> *"I don't think there is a huge amount of awareness of different people's roles. I think there's definitely doctors and nurses and then there's probably a bigger proportion of people who understand what physios do because there seems to be quite a lot of people who come to us, to a lesser degree people who know about occupational therapy and to a lesser degree speech and language and dietitians..."* ***[S9, Physiotherapist]***

The dietitian's role also appeared to be stereotyped among HCPs. While there was an advocacy for the inclusion of a dietitian within the falls MDT, there was a misconception about their role in the rehabilitation of older people and what the dietitian's assessment and interventions might consist of. One occupational therapist described that nutrition was not part of the guidelines used in care.

> *"…we are kind of a bit in tuned kind of old school thinking in the NICE guidelines where its certain areas, and nutrition never used to be one of those main areas…"* ***[S10, occupational therapist]***

Additionally, the dietitian's ability to set realistic goals was questioned.

> *"…advice on how it is going to fit to everyday life……. with smaller goals as such, so it doesn't feel so overwhelming for the patient……..I think it's good when dietitians set more realistic …sometimes I find they are given a bit more big goals…"* ***[S10, occupational therapist]***

This view was expressed by both experienced and junior HCPs across settings and likely reflected the lack of knowledge of dietetic practice and lack of accessibility to the dietetic services.

3.3 Strategies for nutritional support

This subtheme highlights the strategies identified by HCPs and service users needed to support the delivery of nutritional care by HCPs in the falls service.

3.3.1 Increasing motivation and support

The majority of HCPs described a need for more training to both identify those at nutritional risk and provide any first-line management. All HCPs welcomed input for additional support including training opportunities and increasing nutritional knowledge.

> *"…training and being able to easily give patients information because it's not my speciality."* ***[S7, Physiotherapist]***

Training was suggested to increase knowledge of the role of nutrition in older adults and falls and on skills for the identification and first-line management of nutritional need during key contact. Training on the process of dietetic referrals was also suggested such as: prompting and flagging questions embedded within the CGA, what to look for, and nutritional screening training.

> *"trainings on completing scores and the reasons for it and why it's really important that is always going to be really beneficial…"* **[*S11, physiotherapist]***

> "*knowing when to refer patients to dietitians would be handy…*" **[*S11, physiotherapist]***

Guidelines and resources were mentioned as helpful tools for the provision of information to patients if they were easily accessible. However, training sessions were preferred to grasp the information.

> *"I don't have time to give a patient, like google something and give it to them, so maybe something that is easily accessible that I could give to them if it's you know maybe to highlight different issues."* ***[S6, physiotherapist]***

> *"I think obviously guidelines are helpful, but again I think it's realistic how our staff are going to be reading it when they got a lot of keeping up to date with their own reading professional and stuff, personally I find the best thing that does help is like on the job training"* ***[S10, occupational therapist]***

A need for motivation and support was also reported among service users and exercise classes were seen as opportunities to encourage group motivation.

> *"Well these sort of classes I would think would be perfect really, because you are here to gain strength and help your balance and generally to improve your life, so these sorts of classes would be the perfect way to speaking to somebody that you could get help from to maybe, not only start the process, but actually keep to the process."* ***[P7]***

> *"…suppose if a group of people came together and talked about it and all of our experiences I suppose that would be a good idea…"* ***[P5]***

Additionally, service users highlighted the importance of communication with HCPs to support and motivate them in making healthy choices.

> *"…so you they should talk to us about foods that we eat and how to reduce the amount of the foods that we eat and add other things with the foods, yes, and also that maybe encourage us…"* ***[P12]***

> *" I think because so many elderly people are lonely the idea of somebody coming in to talk to them or somebody to advice to have a little group meeting…"* ***[P9]***

The inclusion of a nutritional component or educational session in group exercise classes were also echoed by HCPs (theme 1). Such sessions would provide opportunities for the prevention of nutritional problems and the provision of cross-boundary care within the community.

> *"I think the strength and balance groups and the CEC classes [community exercise] are very good place from a proactivity point of view to be giving education, because you have that sort of, that age group that still does take sort of health choices…. and still make decisions for themselves and can proactively do things and actually information at that point is often very well received..."* ***[S15, consultant]***

Additionally, both HCPs and service users highlighted the importance for these strategies to be practical and fit in within routines and everyday life. For HCPs, training on the prompts for flagging nutritional risk were described as strategies that wouldn't provide additional burden within the HCP roles.

> *"Reminders literally. Because it's not too much of a burden to ask these questions……. it's not something that is going to slow us down its just wasn't on there."* ***[S7, nurse]***

Similarly, service users suggested strategies that would promote their understanding of the benefits of nutrition for health and the benefits of improving eating habits when presenting with specific health concerns. These included: practical recipes and fact sheets of practical food options.

> *"…well it would be interesting to sit down with someone and talk about easy food that you could cook…"* ***[P8]***

> *"…it would be nice to have cooking lessons, so you understand about the food prep of what you are about to eat and also looking at the benefits …*" ***[P12]***

3.3.2 Integration and improving communication of nutrition

Strategies for improving integration and collaboration with dietetic services were highlighted to increase accessibility and communication with dietitians (sub-theme 3a).

> *"…it would be interesting to hear from a dietitian to see when they would like to receive referrals. So, I think we should work maybe a bit more hand in hand, because we're making people more active and obviously you need nutrition to support that, yea that would be helpful I think."* ***[S6, physiotherapist]***

HCPs suggested integration of dietetic services with the falls MDT or through increased access such as telephone contact or discussion of cases with a dietitian.

> *"definitely, having a dietitian involved in the clinic, also just having even if its having a hotline so we know if we are unsure with a patient who can we ring to kind of get that advice……but having someone, that link person, that liaison…"* ***[S10, occupational therapist]***

Communication with a dietitian and sharing knowledge between professions was highlighted as helping to improve nutritional knowledge and to help prompt early identification and advice.

"I've always had really positive conversations with kind of the dietitians on the ward, I guess cause they are not present all the time because of staffing, but each time I do discuss with them it is kind of brought up a lot of ideas and make sure to kind of prompt me to make sure to kind of identify information for like carers and that will help the patient ." **[*S11, physiotherapist]***

"…in my head is to inform, educate, share that knowledge to the nurses on how to in terms of, okay, yes we are nurses, yes we do the screening, but how are you being re-assured that this is how it should be delivered, it is being said to the patient…" ***[S4, nurse]***

6.4.3 Shared HCP and service-user touchpoints from thematic analysis

This section highlights the key "touchpoints" identified by service users and the carer. The touchpoints are the "crucial moments" which highlight the service users' experiences and where we can aim to target nutritional interventions. Fourteen touchpoints were identified which correspond to the subthemes and shared overarching themes (**table 6.3**). Touchpoints were selected by myself and validated at a second follow up meeting with the service users, where these were also prioritised into key improvement priorities (see section 6.3 in the methods section). Once these touchpoints were validated with the service users, the film clips representing these moments were chosen to create the trigger film which best portrays the narrative stories to be used for future educational and service improvement purposes within KCL and GSTT (separate to this thesis). The shared themes, touchpoints and strategies suggested by HCPs and service users during interviews are summarised in **Table 6. 3**. These will be used to further guide the development of nutrition intervention strategies in the future.

Table 6.3: Touchpoints highlighted by service users corresponding to the overarching themes and subthemes and translated into shared improvement priorities

Shared overarching themes	Subtheme	Service user Touchpoints	HCP and Service User shared improvement priorities
Patient is complex, but is nutrition part of their story	*Can we change? The perceived potential for change*	• Eating less is part of ageing • Set in our ways • Struggles with age (e.g. health) • No problems =no change needed • Eating to get by • Beliefs and knowledge on the importance of nutrition and wellbeing or survival • Independence or lack of & social situation	(1) Increasing nutritional knowledge
Everyone's job, no one's responsibility	*No-one asks*	• No-one brings it up in consultations • Responsibility to bring up (expectations) • Doing it on your own • A need for holistic approach	(2) Improving communication within consultations
	Strategies for support	• A need for motivation and support – (strategies) • Age-specific education • Knowledge & why need nutrition	(3) Improving motivation and support
Is the dietitian invisible?	*Understanding the role of the dietitian*	• Rare nutrition appointments	(4) Increasing the visibility of the dietitian and dietetic services

6. 5 Discussion

This qualitative study set out to identify the perceptions and experiences of service users, carers and HCPs of nutritional care within two multidisciplinary falls prevention services. Three overall shared themes were identified between the HCPs, service users and carers highlighting consistencies in perception and experiences of nutritional care provision in falls prevention services within each group: *'the patient is a complex story, but is nutrition part of it*', *'everyone's job, but no one's responsibility'*, and '*is the dietitian invisible?'* This study highlighted several important issues: the limited and non-standardized nutritional service provision within the multidisciplinary falls services, the lack of understanding and responsibility of nutritional care practices among the HCPs, the challenges of lack of time, knowledge and experiences in providing nutritional care, the lack of accessibility to dietetic services and limited awareness of the role of the dietitian among HCPs. Interviews with service users highlighted varied perceptions of the role nutrition plays within their health journey and the mixed perceived potential for making nutrition-related health changes, the need for motivation and support in seeking nutritional information on their own, and the lack of understanding of the role of the dietitian. Two key gaps were highlighted between HCPs and service users. HCPs were more aware of the links between nutrition and health than service users. There was also a gap on the responsibility for discussing nutrition, where majority of service users expected HCPs to discuss this topic. On the other hand, HCPs felt that service users were not forthcoming or did not link nutrition and health. This section is divided into discussion of (1) HCP and (2) service user findings.

6.5.1 HCPs

Similar to the results reported in chapter 5 (survey of falls prevention services within England), nutritional care and dietetic involvement was limited within both the outpatient and community falls services in this study. Most HCPs in this study were physiotherapists and occupational therapists at the front-line and interventions provided related to physical rehabilitation including mainly one-to-one physiotherapy and group strength and balance classes along with medical care. In agreement with the limited literature in this area (Castro et al., 2020), the nutritional care provided by HCPs in the outpatient and community falls services in this study was not standardized, with sub-optimal identification of nutritional risk and limited referral to dietitians. Two qualitative studies evaluated the management of malnutrition by GPs (n=16) (Castro et al., 2020) and HCPs working in community and primary care (n=75) (Browne et al., 2021) in Ireland. Malnutrition was seen as a secondary concern with ad hoc processes for the recognition and diagnosis of malnutrition reported among GPs. Several gaps in primary care management were highlighted such as at-risk patients being missed by HCPs and delayed treatment of malnutrition (Browne et al., 2021; Castro et al., 2020). Screening of malnutrition can be performed by non-dietetic HCPs and is recommended within the trust practice guidance. The outpatient falls service included nutritional screening questions (MUST) in the standardized assessment tool (Proforma). Although the tool was developed by the MDT themselves, this activity was not reported to be performed routinely by any of the HCPs in both the outpatient and community falls clinic. Additionally, HCP interviews highlighted a fundamental misunderstanding of the role of nutrition screening, where nutritional screening or further probing questions were used on those in whom malnutrition was suspected rather than on everyone. Therefore, this can result in

missed identification of individuals who may be at risk of malnutrition. Data from a few studies evaluating nutritional screening practices have also highlighted the use of subjective assessment or professional judgement when identifying individuals at risk of malnutrition in hospital, rather than a validated tool (McCarron et al., 2010; Raja et al., 2008). A 6-week service evaluation of dietetic referrals on three hospital wards highlighted 53% of referrals to the dietetic department were not initiated by the nutritional screening tool (NST) (McCarron et al., 2010). Reasons for referral in these cases were judgment based on visual examination, referral as a last resort to patient treatment, and referral for a particular treatment such as nutritional supplements (McCarron et al., 2010). Furthermore, while HCPs frequently described nutrition as important, they also reported that this knowledge did not translate into clinical practice and reported challenges around the provision of nutritional care or the perceived lack of access to dietetic services.

The requirements for improving engagement for first-line management of nutritional issues, may be addressed through framing interventions around the behavioural influences on clinical practices described which may be guided by behaviour change theory (Michie et al., 2011). Currently there is a limited inclusion of nutritional education within medical and nursing education (DiMaria-Ghalili et al., 2014; Van Horn et al., 2019). Thus, providing nutrition education to medical and nursing students at degree level can help increase the knowledge and understanding of the role of nutrition (DiMaria-Ghalili et al., 2014; Van Horn et al., 2019), which may be translated into practice within their clinical roles. However, despite increased knowledge, translation into practice does not always occur, as demonstrated within this study findings.

While in theory, promoting HCP involvement in nutritional care for the detection and first-line management of malnutrition through "making every contact count" is an opportunity to help tackle the burden of untreated malnutrition, it is important to consider this strategy alongside the challenges of including additional roles for non-dietetic HCPs who are practicing within their own professional roles. The idea of role identity was a key statement highlighted by several HCPs (specifically OTs and PTs) in their interviews. This was perceived as concern for both the additional work of including an additional component within the assessment and the consequence of leaving another assessment component out to prioritize nutrition. Interviews highlighted the lack of insight and knowledge into looking beyond their role or what they were trained to achieve within their role, therefore, the question as to whether nutrition can fit in remains. Promoting first-line management of nutrition by HCPs may result in additional responsibilities, resources and training.

The barriers to nutritional screening and the use of the MUST screening tool include lack of time and resources, lack of knowledge and the need for training on nutritional screening practices and tool, a lack of ease and acceptability of screening tool, and preference for use of clinical judgment (Green & James, 2013). The current study provides further evidence on the barriers to prioritizing nutrition, which suggests a need for new strategies to optimise use of nutritional screening by HCPs. In this study, HCPs, specifically nurses, reported carrying out the "nursing" part of the CGA in a conversational manner. Introducing nutrition during consultations in this less formal way may be a potential strategy for nurses and HCPs to identify patients at nutritional risk. Research is needed to evaluate the validity of this strategy to correctly identify at risk individuals in different populations and settings. Although there is no "gold standard" tool, there is substantial evidence highlighting validity of the different

screening tools such as MUST and MNA in identifying individuals at risk (Cederholm et al., 2019). However, few studies have demonstrated ways in which tools may be optimized for use in clinical practice among the busy schedules and competing priorities of nurses and other HCPs. For example, a survey among nurses across 11 Canadian hospitals (n=723 nurses), 91% of nurses reported they would incorporate '3-question nutrition screen' into their practice (Duerksen et al., 2016). Thus, re-iterating the need for simplified criteria to help break the barrier of limited time and competing priorities. Further research is needed on how best to implement and maintain use of these tools by non-dietitians in clinical practice.

Use of "nudges" and "prompts" to address questions already embedded within the CGA may be a first line strategy for signposting to further screening procedures or referral to a dietitian. The "nudge theory" is a method aimed at shaping the environment or 'choice architecture' to influence behavioural change and improve decision making among the public (Thaler & Sunstein, 2008). This theory highlights a potential opportunity for the implementation of nudge interventions to be used for improved nutritional care for tackling malnutrition within the community. Nudge theory strategies to tackle obesity highlighted an average 15% increase in healthier consumption decisions as a result of nudge interventions on a group level (Arno & Thomas, 2016). This theory can work on an individual level as well as on a group or public health level. A Cochrane review of 42 RCTs evaluated nudge strategies to improve healthcare providers' implementation of evidence-based guidelines, policies and practices (Yoong et al., 2020). While results of this review found nudge strategies comparable to other implementation strategies for changing, a key limitation includes the broad types of strategies available (Yoong et al., 2020).

A novel tool for the early identification of nutritional risk has been developed by the Patients Association and Wessex Academic Health Science Network known as the "Patients Association Nutrition Checklist" (The Patients Association, 2020) which can be used by non-dietetic HCPs, aimed at identifying risk within the community. This checklist consists of two sections with the first embedding validated questions surrounding weight, unintentional weight loss and loss of appetite with a guide on how this should be communicated to promote a discussion around nutrition. This is followed up by a second section for individuals identified at risk from the first section, "nudging" HCPs to further discuss the reasons for being at risk, and provides a guide for first-line nutritional advice and subsequent signposting services for support (The Patients Association, 2020). In addition, the Patients Association Nutrition Checklist also provides a "patient version" of the two sections for identification and further discussion of nutritional support, which may be used as a tool for "self-screening" (The Patients Association, 2020). Findings on the current study highlighted long waiting time for patient consultation within the outpatient falls clinic (2 hours). The implementation of a self-screening tool may be a strategy used to tackle both the long wait times and staff time challenges within consultations (Huhmann et al., 2013). However, HCPs are still needed to interpret and process findings, thus guidance and training is still warranted.

In a recent study, HCPs (n=23) involved in the hospital and home care of older people were interviewed to explore their views on individualised nutritional care within this population (Hestevik et al., 2019). This study highlighted the complexity of the older adult patients perceived by HCPs and also reported themes similar to my findings. HCPs reported nutritional problems were complex among the older people and required seeing the patient as a "whole". Similar barriers such as lack of time to

individualise nutritional care and a lack of interdisciplinary approach were also highlighted (Hestevik et al., 2019). Furthermore, the dietitian's role was stereotyped by both the HCPs and service users. This is similar to findings from the study of GPs by Castro et al. (2020), where malnutrition was seen as a secondary diagnosis and not prioritised. This also raises the question as to whether nutrition was also seen as too complex to bring up among the complex patients. As discussed in previous chapters, gaps in identification and appropriate dietetic referral resulted in delayed management of individuals at nutritional risk with the potential for further health consequences. Therefore, this highlights the need for increasing the visibility of the dietitian, the dietetic services and role of nutritional care among the MDT falls service and strategies to address the challenges of accessibility to dietetic services reported by HCPs. Increased accessibility of dietitians is also needed in promoting the aspects of nutritional care which can be carried out by nurses and non-dietetic HCPs (first-line management) and other aspects as specialist and warrant onward referral (can only be carried out by dietitians). Findings from the literature (Avgerinou et al., 2019) and from this study (chapter 6) demonstrated service users welcomed discussion of nutrition by HCPs. My findings reported nutrition was not brought up within consultations, thus, it is important to equip HCPs with the knowledge of the role of dietetics. Findings from HCP interviews suggested a need for a protocol-driven intervention for appropriate identification, management and referral pathways, together with training to increase confidence, expertise and knowledge.

6.5.2 Service users

In line with several studies evaluating the perception of older adult populations on nutritional care, the findings highlighted the perception of eating less as being a standard part of ageing and many participants did not recognize the need to change

their dietary habits at older age. Similarly, this was echoed by Lundkvist et al. (2010) in their study exploring 524 older people's views and management of healthy eating across several European countries. In this study participants perceived it to be "too late to change" and thought that change would not be meaningful at this stage of their life (Lundkvist et al., 2010). Furthermore, Avgerinou and colleagues (2019) explored the views and dietary practices of 24 older adults and carers at risk of malnutrition in London and reported similar findings; a lack of awareness of the risk of malnutrition among older adults and the view that eating less and weight loss were natural parts of the ageing process (Avgerinou et al., 2019).

Payne et al., 2020 also recently highlighted this perception of "inevitable decline" in appetite and intake among this population in a qualitative study interviewing 23 older adults (65-94 years) (Payne et al., 2020). Interestingly within this study, the authors selected participants at risk of malnutrition with chronic health or social conditions (e.g. living alone). This study highlights the physical and physiological declines with age which was perceived to influence the change in nutritional habits (Payne et al., 2020). However, while Payne et al. (2020) addressed factors associated with older adult's health and nutritional beliefs to help guide and suggest future interventions the authors did not specify behavioural or individualised techniques needed for targeting intervention delivery.

My findings highlighted the perception among this population of eating to survive rather than for enjoyment or health benefits. Evidence within the literature has demonstrated how food is often seen as an obligation among the older population. In a study by Preston et al. 2018 exploring the prevalence and perceptions of malnutrition among older people attending a GP in Australia, individuals also reported eating

because “they have to” (Preston et al., 2018). In both the study by Preston et al. 2018 and Lunkvist et al. 2010, mixed views were also reported among some participants who viewed nutrition and healthy eating as beneficial with age (Lundkvist et al., 2010; Preston et al., 2018). Similar to my findings, this highlights the mixed range of perceptions among this population. Therefore, in clinical practice, one-size does not fit all, and further research is needed to appropriately target resources towards strategies according to individualised behaviours. Participatory learning has been employed as a method to change attitudes and knowledge surrounding dietary behaviour around older adults (Wallace et al., 2016). For example, Wallace et al., 2016 demonstrated dietary behaviour changes after a 4–week dementia specific nutrition education intervention among 72 older adults (Wallace et al., 2016).

Similar to the HCPs, there was stereotyping and lack of understanding of both the role of nutritional care and the role of the dietitian by service users. Findings from service user interviews highlighted that discussion of diet was linked with misconceptions about ‘sugar’ and ‘fat’. Findings from Avgerinou et al. (2019) and Jensen et al. (2019) also echoed these findings, demonstrating the perception of older adults that being “thin” is equivalent to healthy and snacking is equivalent to unhealthy. Hence low-fat foods were avoided. Furthermore, service users had mixed views regarding their nutritional health; at one end of the spectrum service users were interested and proactive with regards to their nutritional health, whilst at the other end, service users were “just getting by” and “set in their ways”. The notions of being “set in their way” and confident in their own knowledge and experiences to make nutritional choices have been reported in several studies exploring older people’s perceptions of health and nutrition (Avgerinou et al., 2019; McKie et al., 2000). In my study, participants portrayed different characteristics of health locus of control, as either belief in their

own ability to affect health outcomes (internal) or other's outside actions not their self-control to affect health outcomes (external) (Grotz et al., 2011). The psychological theory of the locus of control has been used to understand the behaviours of health beliefs (Grotz et al., 2011). Participants who seek nutritional knowledge and ways to address nutritional needs themselves, may be exhibiting an internal health locus of control. On the other hand, participants who perceive nutritional and health decline as inevitable with age and lack the motivation for change, may exhibit an external health locus of control. Adult individuals with an internal locus of control have been found to have healthy dietary and physical activity habits (Cobb-Clark et al., 2014) while having an external health locus of control has been associated with lower socio-economic status (Grotz et al., 2011), poorer quality of life (Kostka & Jachimowicz, 2010) and increased use of medical services (Hajek & König, 2017). Again, this suggests addressing the individual behavioural influences required for implementing change, which may be guided by the social cognitive or behavioural change theories (Michie et al., 2011). These techniques may aim to increase the older adult's self-efficacy, which has been highlighted as a determinant in engagement with lifestyle interventions (Ashe et al., 2007).

Service users also described how health-related issues impacted on their nutritional needs. Key touchpoints identified were health struggles because of chronic diseases and decreased functional capabilities (e.g. mobility). As highlighted within the literature, health conditions can result in both an engagement with healthcare services (or healthy eating) or a detachment as coping mechanisms (Musich et al., 2020). For some service users in this study new health conditions resulted in a motivation to improve nutrition to mitigate risk factors or symptoms while for others this highlighted the struggle and lack of energy in preparing meals. The expectation by service users

that it was the responsibility of HCPs to bring up the discussion around nutrition, combined with the competing challenges of introducing non-standardized activities and the challenges for HCPs of starting these conversations resulted in gaps in the consultation around bringing up nutrition. Implications result in the missed nutritional needs being identified or addressed. Thus, consideration on who should check service user's needs, such as designating a "nutritional champion" (Murphy et al., 2020). Evidence has highlighted that older adults seek and are open to discuss information regarding nutrition and weight from their GPs, nurses, or pharmacists (Avgerinou et al., 2019; Browne et al., 2021; Douglas et al., 2019; Gall et al., 2001). Similarly, findings in this chapter also demonstrate that some service users are open to discussion, yet, no-one asks. Findings demonstrate a mismatch in the HCPs having the time, skills and experience to do discussing nutrition. This highlights the limitations of "making every contact count" highlighted earlier, where further support is needed for HCPs to highlight nutrition within their role.

Some service users perceived that they should deal with nutritional issues 'on their own' and yet also described the need for motivation to promote lifestyle change (nutrition) through peer support and a social community. Isolation and loneliness were frequently reported as touchpoints. Similar to our results, Bloom et al. (2017) explored the dietary influences of community-dwelling older adults (n=92 participants; mean age: 78 years) through focus groups and reported the positive impact on food intake of social engagement (Bloom et al., 2017). In their study participants described the impact of social activities such as clubs and eating out with friends as positive enablers to food intake while loneliness, eating alone or not having anyone to cook for were associated with poor nutritional habits (Bloom et al., 2017). Common findings within the literature describe how widowed women and men or

older people living alone exhibit negative factors such as skipping meals and cooking less, which may result in an increased risk of malnutrition (Locher et al., 2005; McDonald et al., 2000; Quandt et al., 2000). Similar to my findings, these studies show the impact of these life events on changes in dietary habits (Vesnaver et al., 2015). In a qualitative study exploring eating behaviour and factors among home bound older adults (n=230 participants, mean age: 70.1 years), men were found to be at risk of eating less (Locher et al., 2008). Additionally, this study found that those receiving less care (once daily) by a care giver were also more likely to be eating less (Locher et al., 2008). Interestingly, Locher et al. (2005) highlighted that the presence of someone at meal time, not only within the household was a predictor of reduced development nutritional risk among community dwelling older adults (Locher et al., 2005). Increasing social support while also tackling the gap for motivation of healthy eating within the falls services as described is an improvement priority described by service users in these findings. This may be achieved through the inclusion of front line dietary advice within the community exercise and strength and balance groups (Beck et al., 2015). As part of the NHS long term plan, group falls prevention classes have been promoted as targets within the community to address health promotion in order to increase integrated services to older adults and combat workload capacity (NHS, 2019). Approaches such as promotion of cooking classes and social eating clubs discussed may also address these factors, however future research is needed to assess the cost-effectiveness of these approaches for the appropriate use of resources described further below.

Nutritional interventions targeting social engagement have been shown to be effective in improving health behaviours addressing the factors above and the psychological capabilities discussed earlier (self-efficacy and health locus of control). A

combination of nutritional and exercise intervention of lay volunteers reported by Luger et al. (2016), social support provided by visiting participants was used as a control group which also highlighted improvements in older patient outcomes (n=80 participants). Community cooking classes have been shown to provide nutritional and social benefits in this population. For example, a monthly nutritional education and cooking education intervention aimed at older men (n=19 participants) over eight months, provided by a dietitian within the community increased participant's cooking confidence, healthy skills, and promoted cooking activities at home while also promoting social benefits through the monthly meet ups (Keller et al., 2004). A similar 8-week nutritional education and cooking intervention among both genders (n=144 participants) also found improved changes in dietary habits such as increased fruits and vegetables, whole grains and water intake after the intervention (Moreau et al., 2015). This intervention also highlighted improvements in knowledge, confidence and dietary habits after a post assessment of the intervention. This study also assessed nutritional risk, where the majority of the participants had a low nutritional risk score and normal BMI (Moreau et al., 2015). Thus, these interventions can be used as a preventative approach in the community. These interventions or their elements which tackle the behavioural influence of social support can be integrated into the different exercise group criteria within falls prevention services. These would also provide the opportunity for intervening at early stages aimed at the prevention of nutritional risk. Additionally, this may also play a role in improvement of functional health (e.g. muscle mass and strength) outcomes associated with malnutrition as highlighted in chapter 5.

An overall key theme was the lack of visibility and misunderstanding of the role of dietitians by both HCPs and service users. This raises the consideration whether low

visibility is only due the low workforce numbers among the profession the need to prioritise nutritional care, or specific working practices amongst dietitians. Geraghty et al. (2021) demonstrated an overall perception around the term malnutrition and suggests improved communication for its understanding in practice (Geraghty et al., 2021). However, there is limited evidence understanding the reasons behind the visibility and stereotype around the role of the dietitian.

6.5.3 Strengths and limitations

This study included a range of multidisciplinary HCPs across the two outpatient and community falls services with a range of both junior and experienced professionals, providing representative views of the multidisciplinary falls services. Organisation with the key team gatekeepers and flexibility in conducting the interviews (e.g. to take account of HCPs schedules) provided a great deal of engagement and interest in the study objectives. Similarly, the sample of service users provided a wide representation of the age groups gaining insight into the various nutritional perceptions and experiences with age. Similarly, while this sample was close to representative of the ethnicities within the boroughs, future research is needed to focus on culturally specific experiences and tailored interventions. Unfortunately, only one carer was recruited within the study highlighting the limitations of exploring the experiences carers with falls services. Thus, data on the perceptions of the role carers may not have been fully represented. Most service users with carers were observed to require greater dependence or poorer health, which may be a reason for declining participation within this study. Additionally, this resulted in a limitation as service users who may have been a greater nutritional risk with higher dependency were not recruited. Thus, themes specific to this group were not fully explored.

Additional limitations which must be recognised include the service user population recruited were motivated to "tell their story", of which the majority were keen to be video interviewed. Thus, the voices of service users who may not be motivated to take part in the project, were shy to discuss their nutrition (e.g. at-nutritional risk participants), were limited. Additionally, as highlighted earlier this study evaluated two falls services within one NHS trust in South London. While this study captured experiences in both the outpatient and community settings, further research is needed to evaluate the transferability of our findings and intervention strategies to other services or within the wider community setting (e.g. home bound). As a result of the COVID-pandemic, the later stages of larger co-design process were paused, thus a limitation of this study was that workshops for designing intervention strategies for service re-design were not performed. Future research bringing back these suggested strategies within co-design workshops would be ideal to prioritise the intervention strategies suggested before conducting a feasibility study to assess the outcomes of a chosen intervention. Furthermore, the impact of the COVID-19 pandemic may have resulted in "re-structured" services. Thus, transferability of intervention strategies in these "re-structured" services may also need to be evaluated. For example, conducting group exercise sessions may be currently modified into virtual formats. This study aimed to explore the nutritional experiences of the older adult participants utilising falls services across their healthcare journey regardless of their nutritional risk status. Thus, these findings may be cross cutting and identify opportunities for early identification and first-line management or prevention of malnutrition.

6.6 Conclusions

This study found a lack of knowledge of nutritional care among both HCPs and service users, misconceptions of the role of the dietitian, issues around access to dietetic

services, and a general lack of discussion of nutrition within the healthcare journey. While in theory, non-dietetic HCPs are well placed to identify at risk patients and provide first-line management of malnutrition among older adults, findings demonstrated the lack of knowledge, confidence, and role identity among HCPs. Increasing nutritional knowledge, communication and understanding the role of the dietitian among both HCPs and service users is needed for improving the nutritional care of older adults at risk of malnutrition. However, this may not be sufficient to warrant changes in the roles of non-dietetic HCPs. Increasing the accessibility of the dietitian may be a first step raising awareness on the role nutrition plays within falls prevention and malnutrition risk. Dietitian developed pathways for nutritional care in falls are needed. Findings propose nutritional intervention strategies by HCPs and the older population accessing falls services which help guide the development of complex interventions for the prevention and management of malnutrition in nutritionally vulnerable older people in the community. Strategies included improved referral systems, in service trainings, and integrated nutrition within exercise groups Explorations of the behavioural factors which influence HCP and service users' engagement with nutritional interventions is needed for individualised, tailored interventions. Examples of behavioural factors for both HCPs and service users include increasing psychological and motivational capabilities (e.g. training, knowledge, motivational interviewing). Future research is needed to explore the feasibility of the suggested interventions to target these gaps in both multidisciplinary healthcare teams and older adults within falls prevention services.

Chapter 7: Overall discussion and future research

The research aims of this thesis were to:

1. explore the nutritional care currently provided to nutritionally vulnerable older people in the community
2. establish whether non-dietetic healthcare professionals (HCPs) can provide effective nutritional care to nutritionally vulnerable older people and
3. suggest potential strategies to improve the nutritional care of people accessing falls services.

Four studies utilizing quantitative and qualitative methods were developed to address the research aims which followed the process of the MRC framework for the design of complex interventions (Medical Research Council, 2006).

(1) Data collected from electronic healthcare records (EHR) from a cohort of older adults (aged >60 years) based in the community (n=200) was used to explore the number of contacts in hospital and community settings with HCPs and the proportion of participants with documented nutritional care over a 12-month period. During the study period, the group at high nutritional risk had higher risk of contact with hospital and community services and professionals than the group at low nutritional risk. Additionally, the multidisciplinary outpatient and community falls services were identified as a key department contact, presenting potential opportunities to work with service users and HCPs to understand how nutritional care may be integrated into the pathway. Overall documented nutritional care appeared to have relevant nutritional parameters recorded during hospital contacts more than during community contacts. This was more likely during an inpatient stay than on contact with an outpatient clinic, with no association among the nutritional risk groups.

Documented nutritional care appeared to be one-off rather than systematic and ad hoc, resulting in missed opportunities for identification and management of malnutrition.

(2) Findings from the systematic review in chapter 4 (Dabbous et al., 2021) provided baseline evidence characterizing the different nutritional interventions which may be delivered by non-dietetic HCPs. Nutritional interventions within the studies identified were primarily delivered to older adults in hospitals and care homes and mainly by nurses and multidisciplinary teams (MDTs). MDTs within two of these studies comprised physiotherapists and occupational therapists within falls services or aiming to improve functional outcomes (e.g. activities of daily living) (Chen et al., 2019; Palvanen et al., 2014). Three intervention categories (mealtime assistance, nutritional care plan interventions, and multicomponent interventions) had the potential to be implemented by non-dietetic HCPs following training from a dietitian. However, the impact of these interventions on patient outcomes was limited due to low quality of studies and high heterogeneity. In addition, deficiencies in description of the nutritional interventions included in the review as evaluated by the TIDieR checklist limit their potential for replication and implementation. The results of the review indicate the need for higher quality studies, standardization of outcome-reporting and improved reporting of interventions to provide the groundwork for the development of future intervention studies.

(3) The cross-sectional survey of nutritional care practices within multi-disciplinary falls prevention services in chapter 5 highlighted the multidisciplinary involvement within falls prevention, which was dominated by physiotherapists and occupational therapists providing mostly exercise (96%) and environment/assistive technology

(92%) interventions. Results of the survey show that nutritional care policies and practices, and dietitian involvement, are limited within falls services in England.

(4) Using data generated from studies 1 to 3, a qualitative study was conducted to capture service user and HCP experiences and perceptions of nutrition services. The aims were to explore current service provision and to suggest potential nutritional care interventions for integration within multidisciplinary falls prevention services. Shared themes between service users and HCPs identified consistencies in perceptions and experiences of nutrition care provision in falls prevention services with three key themes emerging: "the patient is a complex story, but is nutrition part of it?", "everyone's job, but no one's responsibility", and "is the dietitian invisible?"

7.1 Clinical implications

The overall findings from this thesis highlight several implications for clinical practice. Malnutrition can arise at any time in the older adult's healthcare journey therefore the fact that nutritionally at-risk patients frequently were not identified is concerning. For appropriate intervention to occur, patients need to be identified as nutritionally at risk and relevant actions initiated. Missed identification can lead to negative consequences for the individual's health and for the health and social care system (Elia, 2015). Despite nutritional screening policies being in place, findings from both the cohort study (chapter 3) and cross-sectional survey (chapter 5) highlighted the limited nature of nutritional practices and the frequent missed opportunities for identification of nutritionally vulnerable patients. Thus, it is important to understand why services fail to identify and manage malnutrition. A cross–sectional study examined the presence of a validated nutritional screening tool used on wards across 53 hospitals on nutritional care practices by HCPs compared

with wards where nutrition screening was not used (Eglseer et al., 2017). This study highlighted increased identification of malnutrition prevalence, increased dietetic referral and monitoring of nutritional intake when compared to wards without a validated nutritional screening tool. However a validated tool was used in only 21% of the total patients (Eglseer et al., 2017). The lack of identification among HCPs may suggest a range of barriers such as lack of knowledge, time, confidence or understanding of the role, which was highlighted within the qualitative study in chapter 6. Several studies have also highlighted nurses' views and practices in applying nutritional screening within their practices (Craven et al., 2017; Duerksen et al., 2016; Green & James, 2013), which included: lack of knowledge and competence, time and prioritization, organizational culture such as procedures and managerial support. To date, few studies have aimed to address these complex barriers to nutritional screening practices, this may be difficult due to the different types of wards, patients, and organizational structures and cultures involved. More recently a new procedure for nutritional screening and care for older people attempted to provide a training process for nursing teams to implement nutritional screening and care procedures across the community setting (Bracher et al., 2019). Results of the training process (INSCOPPe) showed high levels of non-completion of training by staff, perceptions of a lack of specialist support among community nurses, and lack of monitoring at a higher organizational level failing to make malnutrition a priority. As a result of this training a nutritional lead role was developed to provide ongoing training and specialist support and a "link" between frontline and organizational levels (Bracher et al., 2019).

There is a lack of consensus for both the diagnosis of malnutrition and the gold standard screening tool for identification of malnutrition risk (Cederholm et al., 2017;

Cederholm et al., 2015), as well as key barriers to the use of screening tools among non-dietetic HCPs. The conversational discussion of nutritional issues was suggested as a potential strategy by HCPs in study 4 (chapter 6), with the joint aims of both identifying high risk participants and increasing awareness of nutrition within the service. The development of the "patient's association nutrition checklist" highlighted in earlier chapters, is an attempt at promoting this discussion by HCPs with the use of guidance to prompt action (The Patients Association, 2020). This tool provides a structured and comprehensive approach to identification of risk followed by guidelines for management or referral. However, the time, training resources, and understanding of the local service pathways in place should be considered when applying this into practice.

Given the position of HCPs in regular contact with nutritionally at-risk populations such as older adults, involving other non-dietetic HCPs in nutritional care is an innovative approach for the management of malnutrition. The "making every contact count initiative" which considers the importance of the opportunities healthcare professionals have for the improvement of health and lifestyle behaviours of the individuals they encounter within practice (Public Health England, 2016) highlights the support needed for HCPs to fully embed this strategy into practice. Implementation of this approach requires organisational readiness for systematic support (e.g. implementing the strategy, providing leadership, planning, infrastructure) and the provision of professional training resources and support needed to equip HCPs and increase competence and confidence for the delivery of behaviour changes to individuals. In a study of public health practitioners who have implemented this initiative in England participants identified variation in the training provided, with some finding the content very broad and others detailed and narrow, adversely

affecting translation into practice (Chisholm et al., 2019). There was a lack of standardisation on the mode of delivery of the intervention in practice. Furthermore, key organisational barriers were highlighted including a lack of resources for training and staffing, cost, commitment in practice while managing roles (e.g. acute roles) (Chisholm et al., 2019). Thus, further support is needed to promote the theories behind the initiative into clinical practice, as with the nutritional strategies this thesis recommends (Bauer & Kirchner, 2020).

Additionally, the majority of screening tools do not provide procedures for further comprehensive assessment and care pathways. Therefore, nutritional pathways such as that highlighted by Keller et al. (2019), should be implemented within the community for not only nutritional screening but also first-line management of malnutrition. This pathway is unique in its systematic approach to assessment and targeting intervention strategies at the cause of the condition. Our findings also highlight the different strategies where nutritional care may be implemented within the integrated rehabilitation pathways for older adult services (e.g. group nutritional education, in service training). However, going forward, clear referral procedures are needed within integrated pathways, as HCPS highlighted key challenges such as lack of understanding of referral procedures and criteria (e.g. use and interpretation of MUST scores). Additionally, further evidence for the effect of this strategies within clinical practice is needed as well as the feasibility within the local falls services (e.g. cost requirements, resources).

Increasing the visibility of the dietitian has the potential to promote and prompt discussions of nutrition within multidisciplinary teams. Since it was reported the MDT teams use knowledge from each other's professions during meetings, inclusion of a

dietitian in the team would promote understanding of the nutritional risk factors to look out for, which may prompt timely referral and/or first-line nutritional advice. This thesis showed the limited number of dietitians employed by the NHS, which means that it may not be possible to have a dietitian on all MDTs. Thus, findings suggest the need for different and innovative actions to be taken to increase dietetic visibility such as training on case studies or a "hot line" with the services or a nutritional lead role as highlighted by (Bracher et al., 2019). The nutritional lead role (dietitian) within the INSCOPPe program was involved in providing a link with the community nursing team, raising the profile of undernutrition and the specialist support available for older people in the community, staff training and implementation of care plans on MUST screening, and further development of support materials and procedures (Bracher et al., 2019). Outcomes from the nomination of the nutrition lead role highlighted improved screening and identification of at-risk patients and increased confidence among the nursing teams (Murphy et al., 2020). Toward the end of this PhD project, a dietitian was employed across the outpatient and community falls service in the London boroughs of Lambeth and Southwark and the findings from this work are being used to support this new dietetic service. Key themes and improvement priorities highlighted in chapter 6 will be shared to help develop the role of the dietitian within the falls services. Collaborative working between myself and the dietitian to feedback the research findings and take forward the study findings to the HCPs in falls services is being planned for future work.

Findings from chapter 3, demonstrate the evidence of the numerous contacts of nutritional vulnerable older people have with healthcare settings and professionals. A key challenge highlighted in chapter 6 was the addition of nutrition in the already saturated professional roles of non-dietetic AHPs. Thus, further research is needed to

address HCP's limited time and resources, and the manager's roles in promoting these changes. It may be possible for dietetic assistants to be involved within the pathway of integration of nutritional care. A systematic review of 11 studies, has highlighted opportunities for nutritional interventions which may be implemented by dietetic assistants, which had positive impact on patient outcomes as part of a multidisciplinary team (Rushton et al., 2021). These interventions included aiding with nutritional screening, meal ordering, assessment and diagnosis of patient nutritional needs, and assistance with rehabilitation including physiotherapy and nutritional care (Rushton et al., 2021). Since there are not enough dietitians to identify all malnourished individuals, dietitians may need to focus on providing training for nutritional identification and first-line interventions delivered by non-dietetic HCPs. Dietetic assistants may also have a role in providing group activities such as nutritional education within exercise classes and social eating clubs. This allows for dietitians to focus on specialist care for those who are referred as high risk and for complex patients.

7.2 Future research

This thesis suggested nutritional intervention strategies which may be implemented within two falls services. Future research is needed to feedback, validate and conduct a feasibility study on the delivery of intervention strategies provided by HCPs in the falls service and the acceptability to service users. This next stage could be accomplished using co-design workshops to model and create the content, and design prototypes of potential interventions as well as to identify the most appropriate strategies which target different service user personas and falls service scenarios. Subsequently, future feasibility studies will be needed to evaluate the outcomes of the chosen nutritional intervention strategies on both patient-reported outcomes and

service improvement outcomes (e.g. adherence and accessibility by HCPs). Additionally, this research focused on two falls services, thus further work is needed to evaluate the transferability of the findings to other similar services such as enablement and rehabilitation services. Strategies may also differ among the other services (e.g. eye department) with numerous contacts among older adults which were highlighted within the cohort study (chapter 3) and home-bound individuals within the community. This also merits further research on their current practices and transferability of nutrition strategies. Lastly, further high-quality RCTs evaluating the effectiveness of interventions by non-dietetic HCPs are needed, which also includes a focus on the content and the quality of reporting of nutritional interventions. Additionally, further research is needed to evaluate the implementation of interventions and to determine the impact of duration, mode and delivery of the interventions on patient-reported, nutritional and service outcomes. Opportunities for the integration of nutritional care within falls services through formal nutritional screening procedures, assessment, first-line nutritional management and continued monitoring throughout contact with the service and procedures for onward referral to dietetic services if necessary has the potential to positively impact patient-centred outcomes.

7.3 Strengths and Limitations

The novelty of the different study methods used within this thesis aimed to address the key questions arising from the exploration of the older adult's healthcare journey and gaps within the evidence base highlighted in the systematic review. The cohort study in chapter 3 provided unique data on healthcare contacts and documented nutritional care over a 12-month period. The elements of the qualitative study provided the opportunity to understand the gaps highlighted from studies 1-3 and explore the

individual perceptions and experiences of both HCPs and service users. Additionally, a strength of this study is the varied HCP participants within our sample ranged from junior to senior professionals and represented the different professions working within the multidisciplinary falls services (consultants, nurses, physiotherapists, occupational therapists, and postural stability instructors). Similarly, the service user participants ranged in age, health conditions and independence and were representative of the older population attending falls services. However, Lambeth and Southwark are ethnically diverse boroughs in south London and this qualitative study had limited input from individuals from different ethnic backgrounds. Therefore, this could limit our understanding of the needs of different ethnic populations in the context of falls services. Future research should also consider addressing culturally-tailored nutritional intervention strategies. This study did not evaluate the nutritional status of the included service users as we were aiming to capture a preventative approach which can transfer across the older population within the community. However, future research may also explore the specific needs of nutritionally vulnerable individuals (identified as undernourished) or individuals at an increased risk due to specific health conditions (e.g. dementia).

A key limitation of the cohort study was the exploratory nature of the convenience sample, which may not be adequately powered. Most studies exploring associations of malnutrition risk have been cross-sectional and focus on the aetiology of malnutrition. The cohort study in chapter 3 adds to the pool of cohort studies in the field by uniquely exploring the healthcare contacts and first-line actions for the management of malnutrition, where future adequately powered research can be built upon. Similarly, the cross-sectional survey of nutritional practices had a low number of included falls services and we don't know the proportion of respondents because

we are unable to know the number of falls services in the UK. The survey in chapter 5 was the first study conducted in the UK to explore the nutritional care practices in falls services. A key limitation in chapter 6 (qualitative study) was the inability to feedback the findings, display the film highlighting "lived experiences" and co-design the intervention strategies. However, data from the interviews suggested strategies which may be considered in future feasibility studies and for future service improvement activities within the falls services. Future co-design workshops with the MDT teams may be considered when choosing and implementing proposed nutritional intervention strategies for service re-design.

7.4 Conclusions

This PhD thesis highlights the missed opportunities for identification and management of patients at nutritional risk and the need for innovative strategies to improve the detection and management of malnutrition in the community to alleviate the burden of management of malnutrition on dietetic services. Findings from HCP and service user interviews provides a premise for the involvement of non-dietetic HCPs in the identification and first-line management of malnutrition and has suggested nutritional intervention strategies for the integration of nutritional care in falls prevention services. This thesis also suggests a new approach to integrate nutritional services within multidisciplinary teams in "making every contact count".

References

Abdelhamid, A., Bunn, D., Copley, M., Cowap, V., Dickinson, A., Gray, L., Howe, A., Killett, A., Lee, J., & Li, F. (2016). Effectiveness of interventions to directly support food and drink intake in people with dementia: systematic review and meta-analysis. *BMC Geriatrics, 16*(1), 26.

Abe, Y., Kawahara, C., Yamashina, A., & Tsuboi, R. (2013). Repeated scenario simulation to improve competency in critical care: A new approach for nursing education. *American Journal of Critical Care, 22*(1), 33-40.

Abell, B., Glasziou, P., & Hoffmann, T. (2015). Reporting and replicating trials of exercise-based cardiac rehabilitation: do we know what the researchers actually did? *Circulation: Cardiovascular Quality and Outcomes, 8*(2), 187-194.

AGE UK. (2019). *Later Life in the United Kingdom 2019*. Retrieved from https://www.ageuk.org.uk/globalassets/age-uk/documents/reports-and-publications/later_life_uk_factsheet.pdf

Amarya, S., Singh, K., & Sabharwal, M. (2015). Changes during aging and their association with malnutrition. *Journal of Clinical Gerontology and Geriatrics, 6*(3), 78-84.

Arno, A., & Thomas, S. (2016). The efficacy of nudge theory strategies in influencing adult dietary behaviour: a systematic review and meta-analysis. *BMC public health, 16*(1), 1-11.

Ashe, M. C., Eng, J. J., Miller, W. C., & Soon, J. A. (2007). Disparity between physical capacity and participation in seniors with chronic disease. *Medicine and science in sports and exercise, 39*(7), 1139.

Auerbach, C., & Silverstein, L. B. (2003). *Qualitative data: An introduction to coding and analysis* (Vol. 21): NYU press.

Australian Government Department of Health. (2021). *Summary Statistics, All Professions*. Retrieved from https://hwd.health.gov.au/resources/data/summary-all.html

Avgerinou, C., Bhanu, C., Walters, K., Croker, H., Liljas, A., Rea, J., Bauernfreund, Y., Kirby-Barr, M., Hopkins, J., & Appleton, A. (2019). Exploring the views and dietary practices of older people at risk of malnutrition and their carers: a qualitative study. *Nutrients, 11*(6), 1281.

Baldwin, C., McGough, C., Norman, A., Frost, G., Cunningham, D., & Andreyev, H. (2006). Failure of dietetic referral in patients with gastrointestinal cancer and weight loss. *European Journal of Cancer, 42*(15), 2504-2509.

Ball, L., Leveritt, M., Cass, S., & Chaboyer, W. (2015). Effect of nutrition care provided by primary health professionals on adults' dietary behaviours: a systematic review. *Family Practice, 32*(6), 605-617.

BAPEN. (2003). *Malnutrition Universal Screening Tool*. Retrieved from https://www.bapen.org.uk/pdfs/must/must_full.pdf

BAPEN. (2014). *Nutrition screening surveys in hospitals in the UK, 2007-2011*. Retrieved from http://www.bapen.org.uk/pdfs/nsw/bapen-nsw-uk.pdf

BAPEN. (2018). Introduction to Malnutrition. Who is at risk of Malnutrition? Retrieved from https://www.bapen.org.uk/malnutrition-undernutrition/introduction-to-malnutrition?showall=&start=1

Bauer, M. S., & Kirchner, J. (2020). Implementation science: what is it and why should I care? *Psychiatry research, 283*, 112376.

Beck, A., Andersen, U. T., Leedo, E., Jensen, L., Martins, K., Quvang, M., Rask, K., Vedelspang, A., & Rønholt, F. (2015). Does adding a dietician to the liaison team after discharge of geriatric patients improve nutritional outcome: a randomised controlled trial. *Clinical rehabilitation, 29*(11), 1117-1128.

Benson, K., & Hartz, A. J. (2000). A comparison of observational studies and randomized, controlled trials. *New England Journal of Medicine, 342*(25), 1878-1886.

Besora-Moreno, M., Llauradó, E., Tarro, L., & Solà, R. (2020). Social and economic factors and malnutrition or the risk of malnutrition in the elderly: a systematic review and meta-analysis of observational studies. *Nutrients, 12*(3), 737.

Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: a tool to enhance trustworthiness or merely a nod to validation? *Qualitative health research, 26*(13), 1802-1811.

Bloom, B. S. (2005). Effects of continuing medical education on improving physician clinical care and patient health: a review of systematic reviews. *International journal of technology assessment in health care, 21*(3), 380-385.

Bloom, I., Lawrence, W., Barker, M., Baird, J., Dennison, E., Sayer, A. A., Cooper, C., & Robinson, S. (2017). What influences diet quality in older people? A qualitative study among community-dwelling older adults from the Hertfordshire Cohort Study, UK. *Public health nutrition, 20*(15), 2685-2693.

Bracher, M., Murphy, J., Steward, K., Wallis, K., & May, C. R. (2019). What factors promote or inhibit implementation of a new procedure for screening and treatment of malnutrition in community settings? A prospective process evaluation of the Implementing Nutrition Screening in Community Care for Older People (INSCCOPe) project (UK). *BMJ open, 9*(2), e023362.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101.

British Dietetic Association. (2020a). *Model and Process for Nutrition and Dietetic Practice* Retrieved from https://www.bda.uk.com/publications/professional/model_and_process_for_nutrition_and_dietetic_practice_

British Dietetic Association. (2020b). *Safe Staffing Safe Workload Guidance*. Retrieved from https://www.bda.uk.com/uploads/assets/32a99a3d-d6da-4e84-9e03ec81ed1c9c7e/safestaffingsafeworkloadguidance2017.pdf

Browne, S., Kelly, L., Geraghty, A. A., Reynolds, C. M., McBean, L., McCallum, K., Clyne, B., Bury, G., Perrotta, C., & Kennelly, S. (2021). Healthcare professionals' perceptions of malnutrition management and oral nutritional supplement prescribing in the community: A qualitative study. *Clinical nutrition ESPEN*.

Bruce, N., Pope, D., & Stanistreet, D. (2018). *Quantitative methods for health research: a practical interactive guide to epidemiology and statistics*: John Wiley & Sons.

Buchan, J., Charlesworth, A., Gershlick, B., & Seccombe, I. (2019). A critical moment: NHS staffing trends, retention and attrition. *London: The Health Foundation*.

Bucur, I. G., Claassen, T., & Heskes, T. (2020). Inferring the direction of a causal link and estimating its effect via a Bayesian Mendelian randomization approach. *Statistical Methods in Medical Research, 29*(4), 1081-1111.

Busetto, L., Wick, W., & Gumbinger, C. (2020). How to use and assess qualitative research methods. *Neurological Research and practice, 2*, 1-10.

Campbell, A. J., & Robertson, M. C. (2006). Implementation of multifactorial interventions for fall and fracture prevention. *Age and ageing, 35*(suppl_2), ii60-ii64.

Casals, C., García-Agua-Soler, N., Vázquez-Sánchez, M., Requena-Toro, M., Padilla-Romero, L., & Casals-Sánchez, J. (2015). Randomized clinical trial of nutritional counseling for malnourished hospital patients. *Revista Clínica Española (English Edition), 215*(6), 308-314.

Castro, P. D., Reynolds, C. M., Kennelly, S., Clyne, B., Bury, G., Hanlon, D., Murrin, C., McCullagh, L., Finnigan, K., & Clarke, S. (2020). General practitioners' views on malnutrition management and oral nutritional supplementation prescription in the community: A qualitative study. *Clinical nutrition ESPEN, 36*, 116-127.

Cederholm, T., Barazzoni, R., Austin, P., Ballmer, P., Biolo, G., Bischoff, S. C., Compher, C., Correia, I., Higashiguchi, T., & Holst, M. (2017). ESPEN guidelines on definitions and terminology of clinical nutrition. *Clinical nutrition, 36*(1), 49-64.

Cederholm, T., Bosaeus, I., Barazzoni, R., Bauer, J., Van Gossum, A., Klek, S., Muscaritoli, M., Nyulasi, I., Ockenga, J., & Schneider, S. (2015). Diagnostic criteria for malnutrition–an ESPEN consensus statement. *Clinical nutrition, 34*(3), 335-340.

Cederholm, T., Jensen, G., Correia, M. I. T., Gonzalez, M. C., Fukushima, R., Higashiguchi, T., Baptista, G., Barazzoni, R., Blaauw, R., & Coats, A. J. (2019). GLIM criteria for the diagnosis of malnutrition–A consensus report from the global clinical nutrition community. *Journal of cachexia, sarcopenia and muscle, 10*(1), 207-217.

Cereda, E., Pedrolli, C., Klersy, C., Bonardi, C., Quarleri, L., Cappello, S., Turri, A., Rondanelli, M., & Caccialanza, R. (2016). Nutritional status in older persons according to healthcare setting: A systematic review and meta-analysis of prevalence data using MNA®. *Clinical nutrition, 35*(6), 1282-1290.

Chan, A.-W., Tetzlaff, J. M., Altman, D. G., Laupacis, A., Gøtzsche, P. C., Krleža-Jerić, K., Hróbjartsson, A., Mann, H., Dickersin, K., & Berlin, J. A. (2013). SPIRIT 2013 statement: defining standard protocol items for clinical trials. *Annals of internal medicine, 158*(3), 200-207.

Chang, C. C., & Lin, L. C. (2005). Effects of a feeding skills training programme on nursing assistants and dementia patients. *Journal of clinical nursing, 14*(10), 1185-1192.

Charlson, M. E., Pompei, P., Ales, K. L., & MacKenzie, C. R. (1987). A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of chronic diseases, 40*(5), 373-383.

Chen, C. C.-H., Yang, Y.-T., Lai, I.-R., Lin, B.-R., Yang, C.-Y., Huang, J., Tien, Y.-W., Chen, C.-N., Lin, M.-T., & Liang, J.-T. (2019). Three nurse-administered protocols reduce nutritional decline and frailty in older gastrointestinal surgery patients: A cluster randomized trial. *Journal of the American Medical Directors Association, 20*(5), 524-529. e523.

Chen, L. L., Li, H., Lin, R., Zheng, J. H., Wei, Y. P., Li, J., Chen, P., & Chen, H. Y. (2016). Effects of a feeding intervention in patients with Alzheimer's disease and dysphagia. *Journal of clinical nursing, 25*(5-6), 699-707.

Chisholm, A., Ang-Chen, P., Peters, S., Hart, J., & Beenstock, J. (2019). Public health practitioners' views of the 'Making Every Contact Count'initiative and standards for its evaluation. *Journal of Public Health, 41*(1), e70-e77.

Cobb-Clark, D. A., Kassenboehmer, S. C., & Schurer, S. (2014). Healthy habits: The connection between diet, exercise, and locus of control. *Journal of Economic Behavior & Organization, 98*, 1-28.

Collins, P. F., Elia, M., & Stratton, R. J. (2013). Nutritional support and functional capacity in chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Respirology, 18*(4), 616-629.

Conzade, R., Phu, S., Vogrin, S., Bani Hassan, E., Sepúlveda-Loyola, W., Thorand, B., & Duque, G. (2019). Changes in nutritional status and musculoskeletal health in a geriatric post-fall care plan setting. *Nutrients, 11*(7), 1551.

Cowan, D. T., Roberts, J. D., Fitzpatrick, J. M., While, A. E., & Baldwin, J. (2004). Nutritional status of older people in long term care settings: current status and future directions. *International Journal of Nursing Studies, 41*(3), 225-237.

Coxe, S., West, S. G., & Aiken, L. S. (2009). The analysis of count data: A gentle introduction to Poisson regression and its alternatives. *Journal of personality assessment, 91*(2), 121-136.

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *Bmj, 337*, a1655.

Craven, D. L., Pelly, F. E., Isenring, E., & Lovell, G. P. (2017). Barriers and enablers to malnutrition screening of community-living older adults: a content analysis of survey data by Australian dietitians. *Australian journal of primary health, 23*(2), 196-201.

Cresswell, J., & Plano, C. VL (2011). Designing and conducting mixed method research. *Thousand Oaks, CA*.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L., & Smith, K. C. (2011). Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health, 2013*, 541-545.

Dabbous, M., Hastings, R., Weekes, C. E., & Baldwin, C. (2021). The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: a systematic review. *Clinical nutrition*.

Davis, J. C., Dian, L., Parmar, N., Madden, K., Khan, K. M., Chan, W., Cheung, W., Rogers, J., & Liu-Ambrose, T. (2018). Geriatrician-led evidence-based falls prevention clinic: a prospective 12-month feasibility and acceptability cohort study among older adults. *BMJ open, 8*(12), e020576.

Deandrea, S., Lucenteforte, E., Bravi, F., Foschi, R., La Vecchia, C., & Negri, E. (2010). Risk factors for falls in community-dwelling older people:" a systematic review and meta-analysis". *Epidemiology*, 658-668.

Dent, E., Chapman, I. M., Piantadosi, C., & Visvanathan, R. (2014). Performance of nutritional screening tools in predicting poor six-month outcome in hospitalised older patients. *Asia Pacific journal of clinical nutrition, 23*(3), 394-399.

Dent, E., Hoogendijk, E. O., & Wright, O. R. (2019). New insights into the anorexia of ageing: from prevention to treatment. *Current Opinion in Clinical Nutrition & Metabolic Care, 22*(1), 44-51.

Dewar, S. L., & Porter, J. (2018). The Effect of Evidence-Based Nutrition Clinical Care Pathways on Nutrition Outcomes in Adult Patients Receiving Non-

Surgical Cancer Treatment: AS ystematic Review. *Nutrition and cancer, 70*(3), 404-412.
DiMaria-Ghalili, R. A., Mirtallo, J. M., Tobin, B. W., Hark, L., Van Horn, L., & Palmer, C. A. (2014). Challenges and opportunities for nutrition education and training in the health care professions: intraprofessional and interprofessional call to action. *The American Journal of Clinical Nutrition, 99*(5), 1184S-1193S.
Doohoo, I., Martin, S., & H, S. (2009). *Chapter 2 Sampling.* . Charlottetown, Canada: Ver Books.
Douglas, P. L., McCarthy, H., McCotter, L. E., Gallen, S., McClean, S., Gallagher, A. M., & Ray, S. (2019). Nutrition education and community pharmacy: a first exploration of current attitudes and practices in Northern Ireland. *Pharmacy, 7*(1), 27.
Dowding, D., Lichtner, V., & Closs, S. J. (2017). Using the MRC Framework for Complex Interventions to Develop Clinical Decision Support: A Case Study. *Studies in health technology and informatics, 235*, 544-548.
Duerksen, D. R., Keller, H. H., Vesnaver, E., Laporte, M., Jeejeebhoy, K., Payette, H., Gramlich, L., Bernier, P., & Allard, J. P. (2016). Nurses' perceptions regarding the prevalence, detection, and causes of malnutrition in Canadian hospitals: results of a Canadian malnutrition task force survey. *Journal of parenteral and enteral nutrition, 40*(1), 100-106.
Dwamena, F., Holmes-Rovner, M., Gaulden, C. M., Jorgenson, S., Sadigh, G., Sikorskii, A., Lewin, S., Smith, R. C., Coffey, J., & Olomu, A. (2012). Interventions for providers to promote a patient-centred approach in clinical consultations. *Cochrane database of systematic reviews*(12).
Edwards, D., Carrier, J., & Hopkinson, J. (2017). Assistance at mealtimes in hospital settings and rehabilitation units for patients (> 65 years) from the perspective of patients, families and healthcare professionals: a mixed methods systematic review. *International Journal of Nursing Studies, 69*, 100-118.
Eglseer, D., Halfens, R., Schols, J., & Lohrmann, C. (2018). Dysphagia in hospitalized older patients: Associated factors and nutritional interventions. *The journal of nutrition, health & aging, 22*(1), 103-110.
Eglseer, D., Halfens, R. J., & Lohrmann, C. (2017). Is the presence of a validated malnutrition screening tool associated with better nutritional care in hospitalized patients? *Nutrition, 37*, 104-111.
Eldridge, S., Spencer, A., Cryer, C., Parsons, S., Underwood, M., & Feder, G. (2005). Why modelling a complex intervention is an important precursor to trial design: lessons from studying an intervention to reduce falls-related injuries in older people. *Journal of health services research & policy, 10*(3), 133-142.
Elia, M. (2015). *The cost of malnutrition in England and potential cost savings from nutritional interventions*. Retrieved from U.K.: http://www.uhs.nhs.uk/Media/Southampton-Clinical-Research/BRCdownloads/ECONOM-REPORT-FULL-18.11.15.pdf
Elia, M., & Russell, C. (2009). *Combating Malnutrition: Recommendations for Action*. Retrieved from https://www.bapen.org.uk/pdfs/reports/advisory_group_report.pdf
Elia, M., Zellipour, L., & Stratton, R. J. (2005). To screen or not to screen for adult malnutrition? *Clinical nutrition, 24*(6), 867-884.

European Federation of the Associations of Dietitians. (2012). Health in the Workplace - The role of the Dietitians in Europe. Retrieved from http://www.efad.org/media/1387/efad-health-in-the-workplace-report.pdf

Eurostat. (2020). Healthcare personnel statistics nursing and caring professionals Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Healthcare_personnel_statistics_-_nursing_and_caring_professionals - Healthcare_personnel

Fairhall, N., Sherrington, C., Lord, S. R., Kurrle, S. E., Langron, C., Lockwood, K., Monaghan, N., Aggar, C., & Cameron, I. D. (2014). Effect of a multifactorial, interdisciplinary intervention on risk factors for falls and fall rate in frail older people: a randomised controlled trial. *Age and ageing, 43*(5), 616-622.

Farrer, K., Donaldson, E., Blackett, B., Lloyd, H., Forde, C., Melia, D., & Lal, S. (2014). Nutritional screening of elderly patients: a health improvement approach to practice. *Journal of Human Nutrition and Dietetics, 27*(2), 184-191.

Fávaro-Moreira, N. C., Krausch-Hofmann, S., Matthys, C., Vereecken, C., Vanhauwaert, E., Declercq, A., Bekkering, G. E., & Duyck, J. (2016). Risk factors for malnutrition in older adults: a systematic review of the literature based on longitudinal data. *Advances in nutrition, 7*(3), 507-522.

Frank, M., Sivagnanaratnam, A., & Bernstein, J. (2015). Nutritional assessment in elderly care: a MUST! *BMJ Open Quality, 4*(1), u204810. w202031.

Gall, M., Harmer, J., & Wanstall, H. (2001). Prescribing of oral nutritional supplements in Primary Care: can guidelines supported by education improve prescribing practice? *Clinical nutrition, 20*(6), 511-515.

Gates, A. B. (2015). Training tomorrow's doctors, in exercise medicine, for tomorrow's patients: BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine.

Geraghty, A. A., Browne, S., Reynolds, C. M., Kennelly, S., Kelly, L., McCallum, K., McBean, L., Clyne, B., Bury, G., & Bradley, C. (2021). Malnutrition: a misunderstood diagnosis by primary care health care professionals and community-dwelling older adults in Ireland. *Journal of the Academy of Nutrition and Dietetics, 121*(12), 2443-2453.

Gomez, F., Curcio, C. L., Brennan-Olsen, S. L., Boersma, D., Phu, S., Vogrin, S., Suriyaarachchi, P., & Duque, G. (2019). Effects of the falls and fractures clinic as an integrated multidisciplinary model of care in Australia: a pre–post study. *BMJ open, 9*(7), e027013.

GOV.UK. (2019). *English indices of deprivation 2019*. Retrieved from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019

Green, S. M., & James, E. P. (2013). Barriers and facilitators to undertaking nutritional screening of patients: a systematic review. *Journal of Human Nutrition and Dietetics, 26*(3), 211-221.

Green, S. M., Martin, H. J., Roberts, H. C., & Sayer, A. A. (2011). A systematic review of the use of volunteers to improve mealtime care of adult patients or residents in institutional settings. *Journal of clinical nursing, 20*(13-14), 1810-1823.

Grossman, D. C., Curry, S. J., Owens, D. K., Barry, M. J., Caughey, A. B., Davidson, K. W., Doubeni, C. A., Epling, J. W., Kemper, A. R., & Krist, A. H. (2018). Interventions to prevent falls in community-dwelling older adults:

US Preventive Services Task Force recommendation statement. *Jama, 319*(16), 1696-1704.
Grotz, M., Hapke, U., Lampert, T., & Baumeister, H. (2011). Health locus of control and health behaviour: results from a nationally representative survey. *Psychology, health & medicine, 16*(2), 129-140.
Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods, 18*(1), 59-82.
Guest, J. F., Panca, M., Baeyens, J.-P., de Man, F., Ljungqvist, O., Pichard, C., Wait, S., & Wilson, L. (2011). Health economic impact of managing patients following a community-based diagnosis of malnutrition in the UK. *Clinical nutrition, 30*(4), 422-429.
Hajek, A., & König, H. H. (2017). Locus of control and frequency of physician visits: Results of a population-based longitudinal study in Germany. *British journal of health psychology, 22*(3), 414-428.
Hamirudin, A. H., Charlton, K., & Walton, K. (2016). Outcomes related to nutrition screening in community living older adults: a systematic literature review. *Archives of Gerontology and Geriatrics, 62*, 9-25.
Hayat, M. J., & Higgins, M. (2014). Understanding poisson regression. *Journal of Nursing Education, 53*(4), 207-215.
Hestevik, C. H., Molin, M., Debesay, J., Bergland, A., & Bye, A. (2019). Healthcare professionals' experiences of providing individualized nutritional care for Older People in hospital and home care: a qualitative study. *BMC Geriatrics, 19*(1), 1-9.
Hickson, M., Bulpitt, C., Nunes, M., Peters, R., Cooke, J., Nicholl, C., & Frost, G. (2004). Does additional feeding support provided by health care assistants improve nutritional status and outcome in acutely ill older in-patients?—a randomised control trial. *Clinical nutrition, 23*(1), 69-77.
Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M., & Welch, V. (2020). *Cochrane Handbook for Systematic Reviews of Interventions version 6.1.* : The Cochrane Collaboration.
Hill, K., & Schwarz, J. (2001). Falls Clinics in Australia: a survey of current practice, and recommendationsfor future development. *Australian Health Review, 24*(4), 163-174.
Hochheimer, C. J., Sabo, R. T., Krist, A. H., Day, T., Cyrus, J., & Woolf, S. H. (2016). Methods for evaluating respondent attrition in web-based surveys. *Journal of medical Internet research, 18*(11), e301.
Hoffmann, T., Glasziou, P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D., Barbour, V., Macdonald, H., & Johnston, M. (2016). Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *Gesundheitswesen (Bundesverband der Arzte des Offentlichen Gesundheitsdienstes (Germany)), 78*(3), 175-188.
Hoffmann, T. C., Glasziou, P. P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D. G., Barbour, V., Macdonald, H., & Johnston, M. (2014). Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *Bmj, 348*, g1687.
Holdoway, A., Anderson, L., & McGregor, I. (2017). A guide to managing adult malnutrition in the community. Including a pathway for the appropriate use of oral nutritional supplements (ONS). 2nd.
Hollingsworth, E. K., Long, E. A., & Simmons, S. F. (2018). Comparison between quality of care provided by trained feeding assistants and certified nursing

assistants during between-meal supplementation in long-term care settings. *Journal of Applied Gerontology, 37*(11), 1391-1410.
Holst, M., Beermann, T., Mortensen, M. N., Skadhauge, L. B., Køhler, M., Lindorff-Larsen, K., & Rasmussen, H. H. (2017). Optimizing protein and energy intake in hospitals by improving individualized meal serving, hosting and the eating environment. *Nutrition, 34*, 14-20.
Hopewell, S., Copsey, B., Nicolson, P., Adedire, B., Boniface, G., & Lamb, S. (2019). Multifactorial interventions for preventing falls in older people living in the community: a systematic review and meta-analysis of 41 trials and almost 20 000 participants. *British journal of sports medicine*, bjsports-2019-100732.
Howson, F., Sayer, A., & Roberts, H. (2017). The impact of trained volunteer mealtime assistants on dietary intake and satisfaction with mealtime care in adult hospital inpatients: A systematic review. *The journal of nutrition, health & aging, 21*(9), 1038-1049.
Huhmann, M. B., Perez, V., Alexander, D., & Thomas, D. (2013). A self-completed nutrition screening tool for community-dwelling older adults with high reliability: a comparison study. *The journal of nutrition, health & aging, 17*(4), 339-344.
Imhof, L., Naef, R., Wallhagen, M. I., Schwarz, J., & Mahrer-Imhof, R. (2012). Effects of an advanced practice nurse in-home health consultation program for community-dwelling persons aged 80 and older. *Journal of the American Geriatrics Society, 60*(12), 2223-2231.
Ioannidis, J. P., Greenland, S., Hlatky, M. A., Khoury, M. J., Macleod, M. R., Moher, D., Schulz, K. F., & Tibshirani, R. (2014). Increasing value and reducing waste in research design, conduct, and analysis. *The Lancet, 383*(9912), 166-175.
Izawa, S., Enoki, H., Hasegawa, J., Hirose, T., & Kuzuya, M. (2014). Factors associated with deterioration of mini nutritional assessment-short form status of nursing home residents during a 2-year period. *The journal of nutrition, health & aging, 18*(4), 372-377.
Johnson, S. C. (2003). The Association Between Nutritional Risk and Falls Among Frail Elderly. *The journal of nutrition, health & aging, 7*, 247-250.
Keller, H., Gibbs, A., Wong, S., Vanderkooy, P., & Hedley, M. (2004). Men can cook! Development, implementation, and evaluation of a senior men's cooking group. *Journal of Nutrition for the Elderly, 24*(1), 71-87.
Keller, H., Laur, C., Valaitis, R., Bell, J., McNicholl, T., Ray, S., Murphy, J., & Barnes, S. (2017). More-2-Eat: evaluation protocol of a multi-site implementation of the Integrated Nutrition Pathway for Acute Care. *BMC Nutrition, 3*(1), 1-15.
Keller, H., McCullough, J., Davidson, B., Vesnaver, E., Laporte, M., Gramlich, L., Allard, J., Bernier, P., Duerksen, D., & Jeejeebhoy, K. (2015). The integrated nutrition pathway for acute care (INPAC): building consensus with a modified Delphi. *Nutrition journal, 14*(1), 1-12.
Keller, H., Valaitis, R., Laur, C. V., McNicholl, T., Xu, Y., Dubin, J. A., Curtis, L., Obiorah, S., Ray, S., & Bernier, P. (2019). Multi-Site implementation of nutrition screening and diagnosis in medical care units: success of the More-2-Eat project. *Clinical nutrition, 38*(2), 897-905.
Kennelly, S., Kennedy, N., Rughoobur, G., Slattery, C., & Sugrue, S. (2010). An evaluation of a community dietetics intervention on the management of

malnutrition for healthcare professionals. *Journal of Human Nutrition and Dietetics, 23*(6), 567-574.
Kim, J.-S., Wilson, J. M., & Lee, S.-R. (2010). Dietary implications on mechanisms of sarcopenia: roles of protein, amino acids and antioxidants. *The Journal of nutritional biochemistry, 21*(1), 1-13.
Kimber, K., Gibbs, M., Weekes, C., & Baldwin, C. (2015). Supportive interventions for enhancing dietary intake in malnourished or nutritionally at-risk adults: a systematic review of nonrandomised studies. *Journal of Human Nutrition and Dietetics, 28*(6), 517-545.
Kondrup, J., Allison, S. P., Elia, M., Vellas, B., & Plauth, M. (2003). ESPEN guidelines for nutrition screening 2002. *Clinical nutrition, 22*(4), 415-421.
Kondrup, J., Johansen, N., Plum, L., Bak, L., Larsen, I. H., Martinsen, A., Andersen, J., Baernthsen, H., Bunch, E., & Lauesen, N. (2002). Incidence of nutritional risk and causes of inadequate nutritional care in hospitals. *Clinical nutrition, 21*(6), 461-468.
Kostka, T., & Jachimowicz, V. (2010). Relationship of quality of life to dispositional optimism, health locus of control and self-efficacy in older subjects living in different environments. *Quality of Life Research, 19*(3), 351-361.
Kvamme, J.-M., Olsen, J. A., Florholmen, J., & Jacobsen, B. K. (2011). Risk of malnutrition and health-related quality of life in community-living elderly men and women: The Tromsø study. *Quality of Life Research, 20*(4), 575-582.
Lambeth Council. (2016). *State of the Borough 2016*. Retrieved from https://www.lambeth.gov.uk/sites/default/files/State of Borough 2016 - v3.pdf
Lassen, K. O., Grinderslev, E., & Nyholm, R. (2008). Effect of changed organisation of nutritional care of Danish medical inpatients. *BMC health services research, 8*(1), 168.
Lassen, K. O., Kruse, F., Bjerrum, M., Jensen, L., & Hermansen, K. (2004). Nutritional care of Danish medical inpatients: Effect on dietary intake and the occupational groups' perspectives of intervention. *Nutrition journal, 3*(1), 12.
Latif, J., Dabbous, M., Weekes, C. E., & Baldwin, C. (2020). The effectiveness of trained volunteer delivered interventions in adults at risk of malnutrition: A systematic review and meta-analysis. *Clinical nutrition*.
Laur, C. V., McNicholl, T., Valaitis, R., & Keller, H. H. (2017). Malnutrition or frailty? Overlap and evidence gaps in the diagnosis and treatment of frailty and malnutrition. *Applied Physiology, Nutrition, and Metabolism, 42*(5), 449-458.
Lawrence, W., Black, C., Tinati, T., Cradock, S., Begum, R., Jarman, M., Pease, A., Margetts, B., Davies, J., & Inskip, H. (2016). 'Making every contact count': evaluation of the impact of an intervention to train health and social care practitioners in skills to support health behaviour change. *Journal of health psychology, 21*(2), 138-151.
Liljeberg, E., Andersson, A., Lövestam, E., & Nydahl, M. (2018). Incomplete descriptions of oral nutritional supplement interventions in reports of randomised controlled trials. *Clinical nutrition, 37*(1), 61-71.
Lindner-Rabl, S., Wagner, V., Matijevic, A., Herzog, C., Lampl, C., Traub, J., & Roller-Wirnsberger, R. (2022). Clinical Interventions to Improve Nutritional Care in Older Adults and Patients in Primary Healthcare–A Scoping Review

of Current Practices of Health Care Practitioners. *Clinical Interventions in Aging, 17*, 1.
Liu, W., Cheon, J., & Thomas, S. A. (2014). Interventions on mealtime difficulties in older adults with dementia: a systematic review. *International Journal of Nursing Studies, 51*(1), 14-27.
Ljungqvist, O., & De Man, F. (2009). Under nutrition-a major health problem in Europe. *Nutricion hospitalaria, 24*(3), 369-370.
Locher, J. L., Ritchie, C. S., Robinson, C. O., Roth, D. L., Smith West, D., & Burgio, K. L. (2008). A multidimensional approach to understanding under-eating in homebound older adults: the importance of social factors. *The Gerontologist, 48*(2), 223-234.
Locher, J. L., Robinson, C. O., Roth, D. L., Ritchie, C. S., & Burgio, K. L. (2005). The effect of the presence of others on caloric intake in homebound older adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 60*(11), 1475-1478.
Lorefält, B., Andersson, A., Wiréhn, A.-B., & Wilhelmsson, S. (2011). Nutritional status and health care costs for the elderly living in municipal residential homes—an intervention study. *The journal of nutrition, health & aging, 15*(2), 92-97.
Low, L.-F., Fletcher, J., Goodenough, B., Jeon, Y.-H., Etherton-Beer, C., MacAndrew, M., & Beattie, E. (2015). A systematic review of interventions to change staff care practices in order to improve resident outcomes in nursing homes. *PLoS ONE, 10*(11), e0140711.
Luck, T., Motzek, T., Luppa, M., Matschinger, H., Fleischer, S., Sesselmann, Y., Roling, G., Beutner, K., König, H.-H., & Behrens, J. (2013). Effectiveness of preventive home visits in reducing the risk of falls in old age: a randomized controlled trial. *Clinical Interventions in Aging, 8*, 697.
Lundkvist, P., Fjellström, C., Sidenvall, B., Lumbers, M., & Raats, M. (2010). Management of healthy eating in everyday life among senior Europeans. *Appetite, 55*(3), 616-622.
Madigan, S., Fleming, P., Wright, M., Stevenson, M., & Macauley, D. (2014). A cluster randomised controlled trial of a nutrition education intervention in the community. *Journal of Human Nutrition and Dietetics, 27*, 12-20.
Manager, R. (2014). Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration.
Mann, C. (2003). Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency medicine journal, 20*(1), 54-60.
Margetts, B., Thompson, R., Elia, M., & Jackson, A. (2003). Prevalence of risk of undernutrition is associated with poor health status in older people in the UK. *European journal of clinical nutrition, 57*(1), 69.
Markle-Reid, M., Browne, G., Gafni, A., Roberts, J., Weir, R., Thabane, L., Miles, M., Vaitonis, V., Hecimovich, C., & Baxter, P. (2010). The effects and costs of a multifactorial and interdisciplinary team approach to falls prevention for older home care clients' at risk'for falling: a randomized controlled trial. *Canadian Journal on Aging/La Revue canadienne du vieillissement, 29*(1), 139-161.
Marples, O., Baldwin, C., & Weekes, C. E. (2017). The effect of nutrition training for health care staff on learner and patient outcomes in adults: a systematic

review and meta-analysis. *The American Journal of Clinical Nutrition, 106*(1), 284-310.
Marshall, A. P., Tobiano, G., Roberts, S., Isenring, E., Sanmugarajah, J., Kiefer, D., Fulton, R., Cheng, H. L., To, K. F., & Ko, P. S. (2020). End-user perceptions of a patient-and family-centred intervention to improve nutrition intake among oncology patients: a descriptive qualitative analysis. *BMC Nutrition, 6*(1), 1-14.
Marshall, S., Bauer, J., Capra, S., & Isenring, E. (2013). Are informal carers and community care workers effective in managing malnutrition in the older adult community? A systematic review of current evidence. *The journal of nutrition, health & aging, 17*(8), 645-651.
Marshall, S., Young, A., Bauer, J., & Isenring, E. (2015). Malnourished older adults admitted to rehabilitation in rural New South Wales remain malnourished throughout rehabilitation and once discharged back to the community: a prospective cohort study. *J Aging Res Clin Pract, 4*(4), 197-204.
Martin-Cantero, A., Reijnierse, E. M., Gill, B. M., & Maier, A. B. (2021). Factors influencing the efficacy of nutritional interventions on muscle mass in older adults: a systematic review and meta-analysis. *Nutrition reviews, 79*(3), 315-330.
Maseda, A., Diego-Diez, C., Lorenzo-López, L., López-López, R., Regueiro-Folgueira, L., & Millán-Calenti, J. C. (2018). Quality of life, functional impairment and social factors as determinants of nutritional status in older adults: The VERISAÚDE study. *Clinical nutrition, 37*(3), 993-999.
McCarron, J., Baldwin, C., & Weekes, C. (2010). Subjective assessment rather than systematic screening to identify malnourished patients for referral to a dietitian. *The Proceedings of the Nutrition Society, 69*(OCE7).
McDonald, J., Quandt, S. A., Arcury, T. A., Bell, R. A., & Vitolins, M. Z. (2000). On their own: Nutritional self-management strategies of rural widowers. *The Gerontologist, 40*(4), 480-491.
McGurk, P., Jackson, J. M., & Elia, M. (2013). Rapid and reliable self-screening for nutritional risk in hospital outpatients using an electronic system. *Nutrition, 29*(4), 693-696.
McIntosh, M. J., & Morse, J. M. (2015). Situating and constructing diversity in semi-structured interviews. *Global qualitative nursing research, 2*, 2333393615597674.
McKie, L., MacInnes, A., Hendry, J., Donald, S., & Peace, H. (2000). The food consumption patterns and perceptions of dietary advice of older people. *Journal of Human Nutrition and Dietetics, 13*(3), 173-183.
Medical Research Council, M. (2006). *Developing and evaluation complex interventions: new guidance* Retrieved from https://mrc.ukri.org/documents/pdf/developing-and-evaluating-complex-interventions/
Meijers, J. M. M., Halfens, R., Neyens, J. C., Luiking, Y., Verlaan, G., & Schols, J. (2012). Predicting falls in elderly receiving home care: the role of malnutrition and impaired mobility. *The journal of nutrition, health & aging, 16*(7), 654-658.
Mendoza-Ruvalcaba, N. M., & Arias-Merino, E. D. (2015). "I am active": effects of a program to promote active aging. *Clinical Interventions in Aging, 10*, 829.

Michel, J.-P., Leonardi, M., Martin, M., & Prina, M. (2021). WHO's report for the decade of healthy ageing 2021–30 sets the stage for globally comparable data on healthy ageing. *The Lancet Healthy Longevity, 2*(3), e121-e122.

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implementation science, 6*(1), 1-12.

Mogre, V., Scherpbier, A. J., Stevens, F., Aryee, P., Cherry, M. G., & Dornan, T. (2016). Realist synthesis of educational interventions to improve nutrition care competencies and delivery by doctors and other healthcare professionals. *BMJ open, 6*(10), e010084.

Moher, D., Schulz, K. F., Altman, D., Group, C., & Group, C. (2001). The CONSORT statement: revised recommendations for improving the quality of reports of parallel-group randomized trials. *Jama, 285*(15), 1987-1991.

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic reviews, 4*(1), 1.

Moreau, M., Plourde, H., Hendrickson-Nelson, M., & Martin, J. (2015). Efficacy of nutrition education-based cooking workshops in community-dwelling adults aged 50 years and older. *Journal of nutrition in gerontology and geriatrics, 34*(4), 369-387.

Moreland, J. D., Richardson, J. A., Goldsmith, C. H., & Clase, C. M. (2004). Muscle weakness and falls in older adults: a systematic review and meta-analysis. *Journal of the American Geriatrics Society, 52*(7), 1121-1129.

Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative health research, 25*(9), 1212-1222.

Murphy, J., Mayor, A., & Forde, E. (2018). Identifying and treating older patients with malnutrition in primary care: the MUST screening tool. *British Journal of General Practice, 68*(672), 344-345.

Murphy, J., Tkacz, D., Bracher, M., Aburrow, A., Allmark, G., Steward, K., Wallis, K., & May, C. (2020). Implementing nutrition screening in the community–results from phase two of a prospective process evaluation of a new procedure for screening and treatment of malnutrition in community care for older people (INSCCOPe-phase two). *Clinical nutrition ESPEN, 35*, 232-233.

Musich, S., Wang, S. S., Slindee, L., Kraemer, S., & Yeh, C. S. (2020). The impact of internal locus of control on healthcare utilization, expenditures, and health status across older adult income levels. *Geriatric Nursing, 41*(3), 274-281.

Neelemaat, F., Bosmans, J. E., Thijs, A., & Seidell, J. C. (2011). Post-discharge nutritional support in malnourished elderly individuals improves functional limitations. *Journal of the American Medical Directors Association, 12*(4), 295-301.

Neelemaat, F., Lips, P., Bosmans, J. E., Thijs, A., Seidell, J. C., & van Bokhorst-de van der Schueren, M. A. (2012). Short-term oral nutritional intervention with protein and vitamin D decreases falls in malnourished older adults. *Journal of the American Geriatrics Society, 60*(4), 691-699.

Ng, T. P., Feng, L., Nyunt, M. S. Z., Feng, L., Niti, M., Tan, B. Y., Chan, G., Khoo, S. A., Chan, S. M., & Yap, P. (2015). Nutritional, physical, cognitive, and combination interventions and frailty reversal among older adults: a

randomized controlled trial. *The American journal of medicine, 128*(11), 1225-1236. e1221.
NHS. (2019). *THE NHS LONGTERM PLAN*. Retrieved from https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/
NHS Digital. (2018a). *NHS Workforce Statistics* Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/june-2018
NHS Digital. (2018b). *NHS Workforce Statistics January 2018*. Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/nhs-workforce-statistics---january-2018.
NHS Digital. (2021). *NHS Workforce Statistics January 2021*. Retrieved from https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/nhs-workforce-statistics---january-2018.
NHS Health Research Authority. (2020). Mental Capacity Act 2005.
NICE. (2006). *Nutrition Support for Adults Oral Nutrition Support, Enteral Tube Feedinga nd Parenteral Nutrition: NICE Clinical Guideline 32*. Retrieved from https://www.nice.org.uk/guidance/cg32/evidence/full-guideline-194889853
NICE. (2013). National Institute for Health and Clinical Excellence. Falls in older people: assessing risk and prevention 2013. Retrieved from https://www.nice.org.uk/guidance/cg161/chapter/Introduction
NICE. (2017). *Nutrition Support for Adults Oral Nutrition Support, Enteral Tube Feedinga nd Parenteral Nutrition: NICE Clinical Guideline 32*. Retrieved from https://www.nice.org.uk/guidance/cg32/evidence/full-guideline-194889853
O'Keeffe, M., Kelly, M., O'Herlihy, E., O'Toole, P. W., Kearney, P. M., Timmons, S., O'Shea, E., Stanton, C., Hickson, M., & Rolland, Y. (2019). Potentially modifiable determinants of malnutrition in older adults: A systematic review. *Clinical nutrition, 38*(6), 2477-2498.
O'Reilly-Shah, V. N. (2017). Factors influencing healthcare provider respondent fatigue answering a globally administered in-app survey. *PeerJ, 5*, e3785.
Office for National Statistics. (2011). *2011 Census* Retrieved from https://www.ons.gov.uk/census/2011census
Olsson, U., Bergbom-Engberg, I., & Åhs, M. (1998). Evaluating nurses' knowledge and patients energy intake after intervention. *Clinical nurse specialist, 12*(6), 217-225.
Omidvari, A.-H., Vali, Y., Murray, S. M., Wonderling, D., & Rashidian, A. (2013). Nutritional screening for improving professional practice for patient outcomes in hospital and primary care settings. *Cochrane database of systematic reviews*(6).
Omran, M., & Morley, J. (2000). Assessment of protein energy malnutrition in older persons, part I: History, examination, body composition, and screening tools. *Nutrition, 16*(1), 50-63.
Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and policy in mental health and mental health services research, 42*(5), 533-544.
Palvanen, M., Kannus, P., Piirtola, M., Niemi, S., Parkkari, J., & Järvinen, M. (2014). Effectiveness of the Chaos Falls Clinic in preventing falls and

injuries of home-dwelling older adults: a randomised controlled trial. *Injury, 45*(1), 265-271.
Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*: Sage publications.
Payne, L., Harris, P., Ghio, D., Slodkowska-Barabasz, J., Sutcliffe, M., Kelly, J., Stroud, M., Little, P., Yardley, L., & Morrison, L. (2020). Beliefs about inevitable decline among home-living older adults at risk of malnutrition: a qualitative study. *Journal of Human Nutrition and Dietetics, 33*(6), 841-851.
Pedersen, P. U., Tewes, M., & Bjerrum, M. (2012). Implementing nutritional guidelines–the effect of systematic training for nurse nutrition practitioners. *Scandinavian journal of caring sciences, 26*(1), 178-185.
Perna, S., Rondanelli, M., Spadaccini, D., Lenzi, A., Donini, L., & Poggiogalle, E. (2019). Are the therapeutic strategies in anorexia of ageing effective on nutritional status? A systematic review with meta-analysis. *Journal of Human Nutrition and Dietetics, 32*(1), 128-138.
Perry, L., & McLaren, S. (2003). Nutritional support in acute stroke: the impact of evidence-based guidelines. *Clinical nutrition, 22*(3), 283-293.
Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version, 1*, b92.
Porter, J., Raja, R., Cant, R., & Aroni, R. (2009). Exploring issues influencing the use of the Malnutrition Universal Screening Tool by nurses in two Australian hospitals. *Journal of Human Nutrition and Dietetics, 22*(3), 203-209.
Poulsen, I., Vendel Petersen, H., Rahm Hallberg, I., & Schroll, M. (2007). Lack of nutritional and functional effects of nutritional supervision by nurses: a quasi-experimental study in geriatric patients. *Scandinavian Journal of Food and Nutrition, 51*(1), 6-12.
Preston, D., Nguyen, T. N., Visvanathan, R., & Wilson, A. (2018). Nutrition and the community-dwelling older person: a pilot study in general practice. *International journal of evidence-based healthcare, 16*(1), 73-80.
Public Health England. (2016). *Making Every Contact Count (MECC):*

Consensus statement. Retrieved from https://www.england.nhs.uk/wp-content/uploads/2016/04/making-every-contact-count.pdf
Quandt, S. A., McDonald, J., Arcury, T. A., Bell, R. A., & Vitolins, M. Z. (2000). Nutritional self-management of elderly widows in rural communities. *The Gerontologist, 40*(1), 86-96.
Raja, R., Gibson, S., Turner, A., Winderlich, J., Porter, J., Cant, R., & Aroni, R. (2008). Nurses' views and practices regarding use of validated nutrition screening tools. *Australian Journal of Advanced Nursing, The, 26*(1), 26-33.
Rasheed, S., & Woods, R. T. (2013). Malnutrition and quality of life in older people: a systematic review and meta-analysis. *Ageing Research Reviews, 12*(2), 561-566.
Rasmussen, N. M., Belqaid, K., Lugnet, K., Nielsen, A. L., Rasmussen, H. H., & Beck, A. M. (2018). Effectiveness of multidisciplinary nutritional support in older hospitalised patients: A systematic review and meta-analyses. *Clinical nutrition ESPEN, 27*, 44-52.
Reinders, I., Volkert, D., de Groot, L. C., Beck, A. M., Feldblum, I., Jobse, I., Neelemaat, F., de van der Schueren, M. A., Shahar, D. R., & Smeets, E. T.

(2019). Effectiveness of nutritional interventions in older adults at risk of malnutrition across different health care settings: Pooled analyses of individual participant data from nine randomized controlled trials. *Clinical nutrition, 38*(4), 1797-1806.

Rist, G., Miles, G., & Karimi, L. (2012). The presence of malnutrition in community-living older adults receiving home nursing services. *Nutrition & Dietetics, 69*(1), 46-50.

Robert, G. (2013). Participatory action research: using experience-based co-design to improve the quality of healthcare services. *Understanding and Using Health Experiences–improving patient care*.

Robert, G., Cornwell, J., Locock, L., Purushotham, A., Sturmey, G., & Gager, M. (2015). Patients and staff as codesigners of healthcare services. *Bmj, 350*.

Rockwood, K., Song, X., MacKnight, C., Bergman, H., Hogan, D. B., McDowell, I., & Mitnitski, A. (2005). A global clinical measure of fitness and frailty in elderly people. *Cmaj, 173*(5), 489-495.

Ross, L. J., Mudge, A. M., Young, A. M., & Banks, M. (2011). Everyone's problem but nobody's job: staff perceptions and explanations for poor nutritional intake in older medical patients. *Nutrition & Dietetics, 68*(1), 41-46.

Royal College of Physicians. (2010). Falling standards, broken promises: report of the national audit of falls and bone health in older people 2010.

Rubenstein, L. Z. (2006). Falls in older people: epidemiology, risk factors and strategies for prevention. *Age and ageing, 35*(suppl_2), ii37-ii41.

Rubenstein, L. Z., Harker, J. O., Salvà, A., Guigoz, Y., & Vellas, B. (2001). Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 56*(6), M366-M372.

Rushton, A., Edwards, A., Bauer, J., & Bell, J. J. (2021). Dietitian assistant opportunities within the nutrition care process for patients with or at risk of malnutrition: a systematic review. *Nutrition & Dietetics, 78*(1), 69-85.

Ryan, R. (2013). Cochrane Consumers and Communication Review Group: data synthesis and analysis. *Cochrane Consumers and Communication Review Group*, 1-5.

Rypkema, G., Adang, E., Dicke, H., Naber, T., De Swart, B., Disselhorst, L., & Rikkert, M. O. (2004). Cost-effectiveness of an interdisciplinary intervention in geriatric inpatients to prevent malnutrition. *Journal of Nutrition Health and Aging, 8*(2), 122-127.

Saka, B., Kaya, O., Ozturk, G. B., Erten, N., & Karan, M. A. (2010). Malnutrition in the elderly and its relationship with other geriatric syndromes. *Clinical nutrition, 29*(6), 745-748.

Schuetz, P., Fehr, R., Baechli, V., Geiser, M., Deiss, M., Gomes, F., Kutz, A., Tribolet, P., Bregenzer, T., & Braun, N. (2019). Individualised nutritional support in medical inpatients at nutritional risk: a randomised clinical trial. *The Lancet, 393*(10188), 2312-2321.

Sergi, G., De Rui, M., Coin, A., Inelmen, E. M., & Manzato, E. (2013). Weight loss and Alzheimer's disease: temporal and aetiologic connections. *Proceedings of the Nutrition Society, 72*(1), 160-165.

Serra-Prat, M., Sist, X., Domenich, R., Jurado, L., Saiz, A., Roces, A., Palomera, E., Tarradelles, M., & Papiol, M. (2017). Effectiveness of an intervention to prevent frailty in pre-frail community-dwelling older people consulting in primary care: a randomised controlled trial. *Age and ageing, 46*(3), 401-407.

Shyu, Y. I. L., Liang, J., Wu, C. C., Su, J. Y., Cheng, H. S., Chou, S. W., Chen, M. C., Yang, C. T., & Tseng, M. Y. (2010). Two-year effects of interdisciplinary intervention for hip fracture in older Taiwanese. *Journal of the American Geriatrics Society, 58*(6), 1081-1089.

Siracuse, J. J., Odell, D. D., Gondek, S. P., Odom, S. R., Kasper, E. M., Hauser, C. J., & Moorman, D. W. (2012). Health care and socioeconomic impact of falls in the elderly. *The American Journal of Surgery, 203*(3), 335-338.

Slinde, F., Grönberg, A., Engström, C.-P., Rossander-Hulthen, L., & Larsson, S. (2002). Individual dietary intervention in patients with COPD during multidisciplinary rehabilitation. *Respiratory medicine, 96*(5), 330-336.

Sobotka, L., & Forbes, A. (2019). *Basics in clinical nutrition* (Vol. 1): Galen.

Southwark Council. (2021). *Census 2011 briefing*. Retrieved from https://www.southwark.gov.uk/council-and-democracy/statistics-and-census/census-2011-briefing?chapter=6&article

Stenhagen, M., Ekström, H., Nordell, E., & Elmståhl, S. (2014). Accidental falls, health-related quality of life and life satisfaction: a prospective study of the general elderly population. *Archives of Gerontology and Geriatrics, 58*(1), 95-100.

Sterne, J., Savović, J., Page, M., Elbers, R., Blencowe, N., Boutron, I., Cates, C., Cheng, H., Corbett, M., & Eldridge, S. (2019). RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ 366, l4898.

Stevens, J. A., Corso, P. S., Finkelstein, E. A., & Miller, T. R. (2006). The costs of fatal and non-fatal falls among older adults. *Injury prevention, 12*(5), 290-295.

Stevens, J. A., Mahoney, J. E., & Ehrenreich, H. (2014). Circumstances and outcomes of falls among high risk community-dwelling older adults. *Injury epidemiology, 1*(1), 1-9.

Stolz, D., Miller, M., Bannerman, E., Whitehead, C., Crotty, M., & Daniels, L. (2002). Nutrition screening and assessment of patients attending a multidisciplinary falls clinic. *Nutrition & Dietetics: The Journal of the Dietitians Association of Australia, 59*(4), 234-240.

Stratton, R. J., & Elia, M. (2006). Deprivation linked to malnutrition risk and mortality in hospital. *British Journal of Nutrition, 96*(5), 870-876.

Stratton, R. J., King, C. L., Stroud, M. A., Jackson, A. A., & Elia, M. (2006). 'Malnutrition Universal Screening Tool'predicts mortality and length of hospital stay in acutely ill elderly. *British Journal of Nutrition, 95*(2), 325-330.

Suominen, M., Kivisto, S., & Pitkala, K. (2007). The effects of nutrition education on professionals' practice and on the nutrition of aged residents in dementia wards. *European journal of clinical nutrition, 61*(10), 1226-1232.

Takahashi, K., Amemiya, K., Nakatsuka, M., Nakamura, K., Kasai, M., & Meguro, K. (2019). Impaired eating and swallowing function in older adults in the community: The Kurihara project. *International journal of environmental research and public health, 16*(20), 4040.

Tappenden, K. A., Quatrara, B., Parkhurst, M. L., Malone, A. M., Fanjiang, G., & Ziegler, T. R. (2013). Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. *Journal of the Academy of Nutrition and Dietetics, 113*(9), 1219-1237.

Teddlie, C., & Tashakkori, A. (2003). Major issues and controversies in the use of mixed methods in the social and behavioral sciences. *Handbook of mixed methods in social and behavioral research, 1*(1), 13-50.

Ten Cate, D., Ettema, R. G., Huisman-de Waal, G., Bell, J. J., Verbrugge, R., Schoonhoven, L., Schuurmans, M. J., Group, B. C. R., Zwakhalen, S., & Vermeulen, H. (2020). Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review. *Journal of clinical nursing, 29*(11-12), 1883-1902.

Thaler, R. H., & Sunstein, C. R. (2008). Nudge: improving decisions about health. *Wealth, and Happiness, 6*, 14-38.

The College of Optometrists. (2021). Falls Directory. Retrieved from https://www.college-optometrists.org/the-college/policy/focus-on-falls/falls-directory-.html

The Patients Association. (2020). the patients association nutrition checklist Retrieved from https://www.patients-association.org.uk/patients-association-nutrition-checklist-toolkit

Thorne, F., & Baldwin, C. (2014). Multimodal interventions including nutrition in the prevention and management of disease-related malnutrition in adults: A systematic review of randomised control trials. *Clinical nutrition, 33*(3), 375-384.

Trevisan, C., Crippa, A., Ek, S., Welmer, A.-K., Sergi, G., Maggi, S., Manzato, E., Bea, J. W., Cauley, J. A., & Decullier, E. (2019). Nutritional status, body mass index, and the risk of falls in community-dwelling older adults: a systematic review and meta-analysis. *Journal of the American Medical Directors Association, 20*(5), 569-582. e567.

Uusi-Rasi, K., Patil, R., Karinkanta, S., Kannus, P., Tokola, K., Lamberg-Allardt, C., & Sievänen, H. (2015). Exercise and vitamin D in fall prevention among older women: a randomized clinical trial. *JAMA internal medicine, 175*(5), 703-711.

Uusi-Rasi, K., Patil, R., Karinkanta, S., Kannus, P., Tokola, K., Lamberg-Allardt, C., & Sievänen, H. (2017). A 2-year follow-up after a 2-year RCT with vitamin D and exercise: effects on falls, injurious falls and physical functioning among older women. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences, 72*(9), 1239-1245.

van der Pols-Vijlbrief, R., Wijnhoven, H. A., Schaap, L. A., Terwee, C. B., & Visser, M. (2014). Determinants of protein–energy malnutrition in community-dwelling older adults: A systematic review of observational studies. *Ageing Research Reviews, 18*, 112-131.

Van Horn, L., Lenders, C. M., Pratt, C. A., Beech, B., Carney, P. A., Dietz, W., DiMaria-Ghalili, R., Harlan, T., Hash, R., & Kohlmeier, M. (2019). Advancing nutrition education, training, and research for medical students, residents, fellows, attending physicians, and other clinicians: building competencies and interdisciplinary coordination. *Advances in nutrition, 10*(6), 1181-1200.

Vandenbroucke, J. P., Von Elm, E., Altman, D. G., Gøtzsche, P. C., Mulrow, C. D., Pocock, S. J., Poole, C., Schlesselman, J. J., Egger, M., & Initiative, S. (2007). Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. *PLoS medicine, 4*(10), e297.

Vanderwee, K., Clays, E., Bocquaert, I., Gobert, M., Folens, B., & Defloor, T. (2010). Malnutrition and associated factors in elderly hospital patients: a Belgian cross-sectional, multi-centre study. *Clinical nutrition, 29*(4), 469-476.

Vasileiou, K., Barnett, J., Thorpe, S., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC medical research methodology, 18*(1), 1-18.

Vassar, M., Pollard, J., Rorah, D., Jellison, S., Harter, Z. J., & Brasseux, S. (2020). Assessment of the completeness of intervention reporting of randomized clinical trials for alcohol use disorders: effect of the TIDieR checklist and guide. *Drug and alcohol dependence, 208*, 107824.

Verbrugghe, M., Beeckman, D., Van Hecke, A., Vanderwee, K., Van Herck, K., Clays, E., Bocquaert, I., Derycke, H., Geurden, B., & Verhaeghe, S. (2013). Malnutrition and associated factors in nursing home residents: a cross-sectional, multi-centre study. *Clinical nutrition, 32*(3), 438-443.

Vesnaver, E., Keller, H. H., Sutherland, O., Maitland, S. B., & Locher, J. L. (2015). Food behavior change in late-life widowhood: A two-stage process. *Appetite, 95*, 399-407.

Visvanathan, R., Macintosh, C., Callary, M., Penhall, R., Horowitz, M., & Chapman, I. (2003). The nutritional status of 250 older Australian recipients of domiciliary care services and its association with outcomes at 12 months. *Journal of the American Geriatrics Society, 51*(7), 1007-1011.

Vivanti, A. P., McDonald, C. K., Palmer, M. A., & Sinnott, M. (2009). Malnutrition associated with increased risk of frail mechanical falls among older people presenting to an emergency department. *Emergency Medicine Australasia, 21*(5), 386-394.

Wallace, R., Lo, J., & Devine, A. (2016). Tailored nutrition education in the elderly can lead to sustained dietary behaviour change. *The journal of nutrition, health & aging, 20*(1), 8-15.

Wang, S.-N., Chang, C.-C., & Lee, P.-H. (2016). Exploration of eating difficulties of patients with dementia. *Hu Li Za Zhi, 63*(4), 128.

Watson, S., Zhang, Z., & Wilkinson, T. J. (2010). Nutrition risk screening in community-living older people attending medical or falls prevention services. *Nutrition & Dietetics, 67*(2), 84-89.

Watterson, C., Fraser, A., Banks, M., Isenring, E., Miller, M., Silvester, C., Hoevenaars, R., Bauer, J., Vivanti, A., & Ferguson, M. (2009). Evidence based practice guidelines for the nutritional management of malnutrition in adult patients across the continuum of care. *Nutrition and Dietetics, 66*(s3), S1-S34.

Weekes, C., Spiro, A., Baldwin, C., Whelan, K., Thomas, J., Parkin, D., & Emery, P. (2009). A review of the evidence for the impact of improving nutritional care on nutritional and clinical outcomes and cost. *Journal of Human Nutrition and Dietetics, 22*(4), 324-335.

Wei, K., Nyunt, M. S. Z., Gao, Q., Wee, S. L., & Ng, T. P. (2019). Long-term changes in nutritional status are associated with functional and mortality outcomes among community-living older adults. *Nutrition, 66*, 180-186.

Westergren, A., Hagell, P., & Hammarlund, C. S. (2014). Malnutrition and risk of falling among elderly without home-help service—a cross sectional study. *The journal of nutrition, health & aging, 18*(10), 905-911.

WHO. (2015). *World report on ageing and health*. Retrieved from https://apps.who.int/iris/handle/10665/186463
WHO. (2018). *WHO Global report on falls Prevention in older Age*. Retrieved from
Wikby, K., Ek, A. C., & Christensson, L. (2009). Implementation of a nutritional programme in elderly people admitted to resident homes. *Scandinavian journal of caring sciences, 23*(3), 421-430.
Williams, V., Boylan, A.-M., & Nunan, D. (2019). Qualitative research as evidence: expanding the paradigm for evidence-based healthcare. *BMJ evidence-based medicine, 24*(5), 168-169.
Yamato, T. P., Maher, C. G., Saragiotto, B. T., Hoffmann, T. C., & Moseley, A. M. (2016). How completely are physiotherapy interventions described in reports of randomised trials? *Physiotherapy, 102*(2), 121-126.
Yoong, S. L., Hall, A., Stacey, F., Grady, A., Sutherland, R., Wyse, R., Anderson, A., Nathan, N., & Wolfenden, L. (2020). Nudge strategies to improve healthcare providers' implementation of evidence-based guidelines, policies and practices: a systematic review of trials included within Cochrane systematic reviews. *Implementation science, 15*(1), 1-30.
Young, A. M., Mudge, A. M., Banks, M. D., Ross, L. J., & Daniels, L. (2013). Encouraging, assisting and time to EAT: improved nutritional intake for older medical patients receiving protected mealtimes and/or additional nursing feeding assistance. *Clinical nutrition, 32*(4), 543-549.
Zhang, Z., Peluso, M. J., Gross, C. P., Viscoli, C. M., & Kernan, W. N. (2014). Adherence reporting in randomized controlled trials. *Clinical trials, 11*(2), 195-204.
Zhou, X. a. T., P. (2016). Effects of Nutrition Nursing on Hemodialysis Patients with End-stage Renal Disease. *Journal of nursing, 5*(1), 19-21.

List of Appendices

Chapter 2 Appendices

Appendix 1: Study Time line

Activities	Year 1 (2017-2018)			Year 2 (2019)			Year 3 (2020)			Year 4 (2021)		
	Oct-Jan	Feb-May	Jun-Sept	Oct-Jan	Feb-May	Jun-Sept	Oct-Jan	Feb-May	Jun-Sept	Oct-Jan	Feb-May	Jun-Sept
1. Development of research												
2. Systematic Review (chapter 4) 3. Data Collection health records (chapter 3)												
4. PhD Upgrade 5. Continued health record collection & begin data analysis 6. Write up protocol and ethics submission for EBCD study												
7. Systematic Review Analysis Mapping Data Analysis												
8. Begin EBCD process: Observations – interviews-validation 9. National Survey (Chapter 5)												
10. Data Analysis of EBCD study (Chapter 6) Ethics amendment												
11. PhD Write Up												

Chapter 3 Appendices

Appendix 2: Standard Operating Procedure (SOP) for Data Collection for health record review and patient journey mapping

Patient contact information	**EPR/E-noting/KHP**	**Care notes**	**Frequency**
• Location of patient contact	EPR: Patient visit or admission history - Date of visit - Care level (inpatient/outpatient) - Facility (hospital) - Location (department)	- Date of first visit -Date of discharge from service - Recurrent visit: Y/N - Service - Team location - Location seen	Documentation of each visit over one year
• Reason for contact	EPR: documents - reason based on 'documents' HCP letter reason seen/admission, referred or diagnosis	Clinical notes - reason documented in notes	Documentation for each visit New or follow up
• Initial health diagnosis	EPR: health issues or documents - health issue or comorbidity, active medical history written in HCP letter	- From EPR	Once
• Healthcare professionals seen	EPR: documents - Written in HCP letter (Profession, team, department)	Clinical notes - Written in note HCP seen (healthcare professional)	Documentation for each visit
• Referral	EPR: documents - HCP letter referred by and date - Scanned upload of referral letter (HCP and date referral) - EVS referral (acceptance of referral, if details above not found)	Date of referral and by who	Documentation for each visit

Patient documented nutritional and health status			
Anthropometrics: • Weight • Height • BMI	E-noting: Observations (nursing notes) & Clinical assessment - anthropometric 'measurement' recordings (weight, height, and BMI) - EPR: documents or inpatient d/c letter Written in HCP letter for anthropometric or *ad hoc* nutritional assessment -Date recorded		
Nutritional Screening: • Performance of nutritional screening Y/N • MUST score • Outcome of screening (e.g. referral) • Date screening performed • The healthcare professional performing screening	E-noting: Observations (nursing notes) & Clinical assessment - anthropometric recordings (weight, height, and MUST screening and referral outcomes) - date recorded - EPR: documents or inpatient discharge letter Written in HCP letter for anthropometric or *ad hoc* nutritional assessment	Clinical notes - in note-description of anthropometric recordings (weight, height, and MUST screening and referral outcomes) - date recorded (date of note)	Documentation for each visit
Nutritional Assessment • Documentation of any nutritional assessment • Date recorded	- E-noting: Observations (nursing notes) & Clinical assessment - EPR: documents or inpatient d/c letter Written in HCP letter for anthropometric or *ad hoc* nutritional assessment	Clinical notes - in note-description of nutritional assessment (*ad hoc*) - date recorded (date of note) - same as EPR definition	

	<u>Definition of nutritional assessment:</u> Any reference to assessment of nutritional status such as: - asking about weight, BMI, evaluation of weight change, food intake, appetite, description patient ('looks thin')		
Nutritional interventions and outcomes: • Documentation of nutritional interventions • Whether a dietitian referral was made • Monitoring arrangements • Types of nutrition interventions provided • The healthcare professional and department providing any intervention • Date recorded	- EPR: documents Written in HCP letter for any *ad hoc* nutritional interventions provided , outcomes (referrals, monitoring) **<u>Definition of nutritional intervention:</u>** Any reference to a type of nutritional intervention provided to improve nutritional status such as: - Providing dietary advice, food examples to improve intake, providing oral nutritional supplements, red trays	Clinical notes - in note-description of *ad hoc* nutritional interventions provided - date recorded (date of note) - same as EPR definition	Documentation for each visit
Nutritional monitoring:	- E-noting: Observations (nursing notes) of changes in nutrition: food charts records, eating drinking, weight changes , referral prompted,	Clinical notes: - in note-description of nutritional changes - same as E-noting definition - date recorded	Documentation for each visit

	discharge planning including nutrition		
Dietitians			
Nutrition & Dietetic Process Criteria (BDA, 2020)*	EPR: documents E-noting: clinical assessments, observations (nursing notes)	Clinical note or uploaded document for initial and follow up visits	Documentation for each visit dietitian seen
• Nutrition Assessment	(ABCDEF) Anthropometry: Weight history Biochemistry Clinical: Past Med History, reason referred Dietary history, Nutritional requirements Environmental/Social history Function	*Same as EPR*	
• Identification of Nutrition Problem *What is the problem?*	Nutritional diagnosis – problem, aetiology, signs and symptoms		
• Nutrition Intervention Plan *What is the intervention?*	Aims Plan – set of activities (e.g. Nutritional support, counselling, food provision) Goals		
• Implementation of Plan & Documentation *What is the action taken and is it documented?*	Action Documented or communicated in records		
• Monitor & Review *What are the revision or follow-up arrangements?*	Review and measurement of nutritional care Follow up Referrals		

	- Record of number of visits (initial or follow up)		
• Evaluation *Were the goals met?*	Comparison against goals		

Table 2: Descriptive Analysis – Definitions and procedures

Variables	Definitions	Procedure
Total number of healthcare visits	Number of visits to any hospital or facility	Count of administrative care
Total numbers of: Facility Care level visits Healthcare professionals	Total number of visits to the hospital groups, care level groups, healthcare professional groups seen	Counts of facility visits, care level visits, healthcare professions Grouped/ coded
Total number of locations	Number of department visits (grouped)	Count of departments Grouped/coded (list of groups attached)
Admission reasons	Admission reason or reason seen by HCP described (grouped)	Count of admission reasons groups/coded (list of groups attached)
Nutritional Care		
Nutritional documentation variables	Variables include: Nutritional assessment, nutritional advice, MUST performed, MUST at risk (score>2) dietitian referral, weight recorded, BMI recorded, BMI recoded as undernourished (BMI<20kg/m^2)	Compute total number of nutritional assessments, advice, MUSTs performed, MUST at risk (score>2) dietitian referrals, weight recorded, BMI recorded, BMI recoded as undernourished (BMI<20kg/m^2) Subgroups: Compute for nutrition documentation variables: performed at least once repeated documentation
Types of nutritional assessment	Weight: assessment of any weight changes e.g. 'have you been losing weight?' Oral Intake: assessment of current food intake e.g. 'have you been eating less?' Diet History: assessment of current and/or usual dietary intake ONS: Oral Nutrition Supplement	Group/Code

	Other: e.g. swallowing difficulty	
Types of nutritional advice	General Dietary: healthy eating guidelines Conditions specific: guidelines related to renal, diabetes, or bone health Weight related: malnutrition weight loss related ONS Changes to diet	Group/Code
HCP providing nutritional assessment, advice or monitoring	Total number of HCP	Counts of the HCPs providing nutritional assessment, advice, monitoring

Appendix 3: Template for Health Record Data Collection based on SOP

Patient Admission Details										
Date	Location of Admission	Date of Admission	Date of Discharge		Reason for Admission		Health Issues	Mortality		
	Health Care Consultations									
	Professional	Profession/Team	Location of Admission	Reason for consult	Nutritional Assessment Provided? Y/N	Type of assessment	Nutritional Intervention provided? Y/N	Type of advice	Nutritional monitoring Y/N	Type of monitoring

	Nutritional & Health Status									
	Weight	Height	BMI	MUST screening preformed Y/N	MUST score	Screening outcome: Referral?	Weight loss reported?	Appetite changes?	Intake changes?	Dietitian Referral (Y/N)
	Dietitian Consultation									

	Reason Referred? Y/N	Diagnosis /Problem	Assessment (ABCD)	Intervention	Monitoring	Documentation of nutritional care? Y/N	Type of documentation

Appendix 4: Full Regression Models

A. Healthcare contacts: Model from Poisson Regression for Hospital and Community contact

Variables associated with total number of healthcare contacts with hospital and healthcare professionals (n=196)								
	Total healthcare visits				**Total HCP contacts**			
Variables in model	Exp (B)	95% Confidence Interval				95% Confidence Interval		
	RR	**Lower**	**Upper**	**p-value.**	**RR**	**Lower**	**Upper**	**p-value**
(Intercept)	7.534	4.723	12.018	.000	1.996	1.132	.642	.668
Clinical Frailty Score at baseline	.945	.901	.992		.911	.863	.961	.001
Age (years) at baseline	.994	.988	1.000	.066	.997	.990	1.005	454
Total co-morbidity score at baseline	1.102	1.068	1.137	.000	1.121	1.086	1.156	.000
Nutrition Risk	1.689	1.488	1.917	.000	1.945	1.680	2.251	.000
Setting	1.065	.834	1.360	.615	5.779	4.231	7.893	.000

Dependent Variable: total number of visits, total HCP contact in hospital
Model: (Intercept), Clinical Frailty Score at baseline, Age (years) at baseline, Total co-morbidity score at baseline , Nutrition Risk, Setting
RR: risk ratio, CI: confidence interval, HCP: healthcare professional

Variables associated with total number of community healthcare contacts and healthcare professionals (n=196)								
	Community service contacts				**Total HCP contacts in community**			
Variables in model	Exp(B)	95% Confidence Interval				95% Confidence Interval		
	RR	**Lower**	**Upper**	**p-value.**	**RR**	**Lower**	**Upper**	**p-value**
(Intercept)	2.201	.601	8.055	. 233	1.589	.412	6.125	.501
Clinical Frailty Score at baseline	1.064	.958	1.182	.249				.196
Age (years) at baseline	.992	.976	1.009	.343	.993	.976	1.010	.398
Total co-morbidity score at baseline	1.041	.973	1.113	.242	1.046	.977	1.120	.194
Nutrition Risk	1.314	.976	1.769	.072	1.429	1.046	1.952	.025
Setting	1.188	.658	2.145	.568	1.289	.693	2.400	.423

Dependent Variable: Total number of services in contact in community; Total number of HCPs seen in community
Model: (Intercept), Age (years) at baseline, Total co-morbidity score at baseline , Clinical Frailty Score at baseline, Setting, Nutrition Risk
RR: risk ratio, CI: confidence interval, HCP: healthcare professional

B. Nutritional Documentation: Models based on Logistic Regression for hospital and community nutritional documentation

Associations between variables and nutritional documentation in hospital (n=196)								
	First-line identification				**Nutritional Screening**			
Variables in model	Exp(B)	95% Confidence Interval				95% Confidence Interval		
	OR	**Lower**	**Upper**	**p-value**	**OR**	**Lower**	**Upper**	**p-value**
Nutrition Risk	.621	.294	1.315	.214	.608	.241	1.534	.292
Setting	.594	.123	2.862	.516	.349	.046	2.627	.307
Age (years) at baseline	1.005	.966	1.045	.817	1.047	.994	1.102	.082
Total co-morbidity score at baseline	1.284	1.022	1.613	.032	1.231	.962	1.574	.098
Clinical Frailty Score at baseline	.817	.604	1.105	.189	1.073	.747	1.541	.702
Constant	.650			.790	.003			.007

Model: Nutrition Risk, Setting, Age (years) at baseline, Total co-morbidity score at baseline, Clinical Frailty Score at baseline.
RR: risk ratio, CI: confidence interval, HCP: healthcare professional

Associations between variables and nutritional documentation in hospital (n=196)								
	Dietitian Referral				**First-line management**			
Variables in model		95% Confidence Interval				95% Confidence Interval		
	OR	**Lower**	**Upper**	**p-value**	**OR**	**Lower**	**Upper**	**p-value.**
Nutrition Risk	.202	.064	.636	.006	.543	.259	1.136	.105
Setting	1.665	.205	13.528	.633	4.660	.956	22.719	.057
Age (years) at baseline	1.001	.947	1.057	.980	1.015	.977	1.055	.442
Total co-morbidity score at baseline	1.255	.968	1.628	.087	1.288	1.027	1.616	.029
Clinical Frailty Score at baseline	1.162	.784	1.724	.454	1.173	.896	1.537	.246
Constant	.050			.168	.031			.032

Model: Nutrition Risk, Setting, Age (years) at baseline, Total co-morbidity score at baseline , Clinical Frailty Score at baseline.
RR: risk ratio, CI: confidence interval

Associations between variables and nutritional documentation in community (n=196)												
	First-line identification				Nutritional Screening				First-line management			
Variables in model	Exp(B)	95% Confidence Interval			Exp(B)	95% Confidence Interval				95% Confidence Interval		
	OR	**Lower**	**Upper**	**p-value**	**OR**	**Lower**	**Upper**	**p-value**	**OR**	**Lower**	**Upper**	**p-value**
Setting	.000	.000	.	.998	.000	.000	.	.998	.000	.000	.	.216
Age (years) at baseline	.957	.870	1.051	.357	.940	.831	1.063	.321	.940	.831	1.063	.751
Total co-morbidity score at baseline	1.351	.946	1.929	.099	1.580	1.002	2.493	.049	1.580	1.002	2.493	.119
Clinical Frailty Score at baseline	.738	.390	1.397	.351	.391	.169	.902	.028	.391	.169	.902	.189
Nutrition Risk	.450	.080	2.521	.364	.197	.019	2.064	.175	.197	.019	2.064	.479
Constant	5.030			.675	135.549			.330	135.549			.100

Model: Nutrition Risk, Setting, Age (years) at baseline, Total co-morbidity score at baseline , Clinical Frailty Score at baseline
RR: risk ratio, CI: confidence interval

Appendix 5: Types of nutritional assessment and advice

Type of nutritional assessment and interventions provided by non-dietetic HCPS on hospital contact according to nutritional risk category (n=196)			
	Total (n=196)	**High nutritional risk (n=82)**	**Low nutritional risk (n=114)**
Nutritional Assessment (total, n=)	N=125	N=99	N=26
	N(%)	N(%)	N(%)
Weight loss and screening	65 (52)	43 (43)	22 (85)
Meal Preparation	20 (16)	17 (17)	3 (12)
Oral Intake (e.g. appetite, eating/drinking)	52 (42)	32 (32)	20 (77)
Dysphagia	10 (8)	4 (4)	6 (23)
Overweight (e.g. High BMI weight assess.)	5 (4)	2 (2)	3 (12)
Bone Health (e.g. calcium)	3 (2)	3 (3)	0
Fluid assessment (e.g. related to weight)	1 (0.1)	1 (1)	0
Known to dietitian	9 (7)	7 (7)	2 (8
Nutritional Advice (total, n=)	N=27	N=22	N=5
	N(%)	N(%)	N(%)
General dietary changes	15 (56)	10 (45)	5 (100)
Condition specific advice (e.g. calcium intake)	8 (30)	7 (32)	1 (20)
Advice related to swallowing	6 (22)	4 (18)	2 (40)
Need to see dietitian	2 (7)	1 (4)	1 (20)
Oral Nutritional Supplements (ONS)	1 (4)	1(4)	0

Type of nutritional assessment and interventions provided by non-dietetic HCPS on community contact according to nutritional risk category (n=196)			
	Total (n=102)	**High nutritional risk (n=62)**	**Low nutritional risk (n=37)**
Nutritional Assessment (total, n=)	N=41	N=31	N=10
	N(%)	N(%)	N(%)
Weight loss and screening	5(12)	3(10)	2(20)
Meal Preparation	3(7)	2(6)	1(10)
Oral Intake (e.g. appetite, eating/drinking)	24(58)	19(61)	5(50)
Dysphagia	7(18)	5(16)	2(20)
Overweight (e.g. High BMI weight assess.)	0	0	0
Bone Health (e.g. calcium)	0	0	0
Fluid assessment (e.g. related to weight)	2(5)	2(6)	0
Known to dietitian	3(7)	3(10)	0
Nutritional Advice (total, n=)	N=10	N=7	N=3
	N(%)	N(%)	N(%)
General dietary changes	4(40)	2(29)	2(67)
Condition specific advice (e.g. calcium intake)	1(10)	1(14)	0
Advice related to swallowing	4(40)	3(43)	1(33)
Need to see dietitian	1(10)	1(14)	0
Oral Nutritional Supplements (ONS)	0	0	0

Chapter 4 Appendices

Appendix 6: Published articles from Systematic Review (chapter 4).

Clinical Nutrition 40 (2021) 4509–4525

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Meta-analyses

The role of non-dietetic healthcare professionals in managing interventions among adults at risk of malnutrition: A systematic review

Massar Dabbous [a, *], Rebecca Hastings [a], C. Elizabeth Weekes [b], Christine Baldwin [a]

[a] Department of Nutritional Sciences, King's College London, London, SE1 9NH, United Kingdom
[b] Department of Nutrition and Dietetics, Guy's and St. Thomas' NHS Foundation Trust, London, SE1 7HE, UK

ARTICLE INFO

Article history:
Received 13 April 2021
Accepted 28 May 2021

Keywords:
Malnutrition
Nutrition risk
Nutrition intervention
Nutrition assessment
Healthcare professionals

SUMMARY

Background: Malnutrition is estimated to affect over three million people in the UK resulting in serious consequences on both the individuals' health and healthcare system. While dietitians are uniquely qualified to provide nutritional interventions, they have one of the lowest workforce numbers in the NHS making it difficult to tackle the malnutrition burden alone. Thus, innovative ways of working are needed. Non-dietetic health care professionals are often involved in the identification, assessment and treatment of malnutrition and research has shown benefits of their involvement in identification and management of nutritional issues, however their role in delivering nutritional interventions has not yet been evaluated. The aim of this systematic review is to collate evidence on the potential roles and effectiveness of non-dietetic healthcare professionals in providing nutritional interventions and their impact on patient-centred outcomes in malnourished or at-risk individuals.

Methods: Three electronic databases were searched on 10th October 2019. Titles and abstracts were initially screened, followed by full texts, against inclusion criteria and included/excluded studies by two authors independently. Data were extracted and tabulated where possible and grouped according to type of intervention and outcomes. Risk of bias and quality of evidence was assessed using the GRADE approach. Data were combined in the form of a narrative synthesis.

Results: Eighteen eligible studies were included; five involved feeding assistance, 10 involved implementing individualised nutrition monitoring or care plans and three were multi-factorial interventions. Interventions took place in a range of settings including hospital and long term care facilities. Very low and low quality evidence suggests that non-dietetic HCP interventions may improve weight, percent of patients reaching estimated energy requirements, quality of life, falls and frailty rate and patient satisfaction. Very low quality evidence suggests that non-dietetic HCP interventions may not improve mid-arm circumference, energy or protein intake, activities of daily living, handgrip strength or length of hospital stay. Low quality evidence suggests that non-dietetic HCP interventions have no effect on mortality.

Conclusions: A lack of good quality evidence on the effectiveness of non-dietetic HCP delivered interventions on the management of malnutrition in adults makes it difficult to draw conclusions. However, this review has highlighted the types of interventions and potential roles of non-dietetic HCPs, providing a groundwork for further high-quality research such as feasibility studies in this area, for the effective management of malnutrition within clinical and community practice.

Abbreviations: ADLs, activities of daily living; BMI, body mass index; GP, General Practice; HCP, healthcare professional; MAC, mid arm circumference; MAMC, mid arm muscle circumference; MNA, Mini Nutritional Assessment; MUST, Malnutrition universal screening tool; NHS, National Health Service; NRS, Nutrition Risk Score; QoL, quality of life; RCT, randomised controlled trials; ROB, Cochrane Collaboration's Risk of Bias tool; UK, United Kingdom.

* Corresponding author.
E-mail address: massar.dabbous@kcl.ac.uk (M. Dabbous).

https://doi.org/10.1016/j.clnu.2021.05.032
0261-5614/

Appendix 7: Example search strategies

Search Strategy for MEDLINE database

All the below as OR:
HCP; Health personnel; health care professional*; health care practitioner*; health care assistant*; healthcare assistant*; healthcare professional*; healthcare practitioner*; health professional*; health practitioner*; health* staff; medic* staff; HCA; clinician*; AHP; allied health personnel; allied health practitioner*; allied health professional*; nurs*; nurse*; doctor*; physician*; GP; general practitioner*; physio*; physical therapist*; OT; occupational therapist*; psych*; social worker*; health* worker*; therapist*; SLT; SALT; speech and language therap*; counsellor*;
(combines as search 1)

All the below as OR:
ONS; oral nut*; oral nut* support; nut* support; food first; food fortif*; drink fortification; food modification; drink modification; fortified food; nutrition* intervention*; nutrition* advice; nutrition* plan; nutrition* care plan; nutrition* care; nutrition* therapy; nutrition* counsel*; nutrition* education*; nutrition* training; nutrition*support; diet* intervention; diet* advice; diet* plan; diet* care plan; diet* therapy; diet* counsel*; diet* education*; diet* training; diet* support; organization* change*; organization* intervention; organization* modification; organization* innovation; organisation* change*; organisation* intervention; organisation*modification; organisation* innovation; environment* change*; environment* intervention; environment* modification; environment* innovation; meal* plan; meal* assist*; eat* assistance; feed* assistance; food assistance; drink assistance; meal* support; meal* help; protected meal*; snack*; nourish* fluid; nourishing drink; nourish* beverage*; nourish* food; meal* delivery; food service*; social support*; breakfast club; lunch club; dinner club; breakfast group; lunch group; dinner group; red tray;
(combines as search 2)

All the below as OR:
Maln*; undernourish*; under-nourish*; weight loss; underweight; under-weight; low body weight; BMI under; body mass index under; low BMI; low body mass index; malnutr* risk; nutr* risk; protein energy malnutr*; poor nutr*; inadequate nutr*; suboptimal nutr*; poor nutr* status; inadequate nutrition* status; suboptimal nutrition* status; elderly*; elderly* care; frail*; older adult*; nutrition* vulnerable*
(Combines as search 3)

All below OR:
parenteral; enteral; obes*; overweight; paed*; (((matern*, pregnan*, diabet*)))
(Combines as search 4)

Final Search:
Search 1 AND search 2 AND search 3 = Search 5
Search 5 NOT search 4

Appendix 8: Protocol to evaluate the reporting quality of nutritional interventions for the management of malnutrition

This protocol was developed for the purpose of our study to evaluate the completeness of reporting of nutritional interventions for the management of malnutrition. The aim of the protocol is to facilitate the use of the 'Template for Intervention Description and Replication (TIDieR) checklist and guide' when carrying out the evaluation of reporting quality in published studies.

Based on the TIDieR checklist, the protocol contains 12 items highlighted below. Completeness of reporting should be scored as 'Complete', 'Partial' or 'Missing' for each item. For an item to be scored as 'Complete', all the information listed in the protocol must be included or referred to in the published study or study protocol. For an item to be scored as 'Partial', at least one item description must be included in the published study or study protocol. Items 9 and 10 may also be scored as 'none' if there is no indication or evidence that any tailoring or modification to the intervention was needed in the study.

To what extent are the following statements consistent with the reviewed study? Answer with Complete, Partial or Missing.

Item number	**Item**	**Item Description (definitions)**	Primary paper (or protocol) (page or appendix)	Primary paper (or protocol (page or appendix number)
			Kapan et al 2017 (Protocol: Dorner et al 2013) (Complete/partial/none)	**Walton et al. 2008** (Complete/partial/none)
1.	**BRIEF NAME**	A brief description that enables easy identification of the type of intervention included in the study and is presented in the title. The title must include key words identifying: 1. Profession *Example*: Volunteer **and** 2. 'nutritional intervention'; 'feeding assistance' in the context of malnutrition	Partial *…lay led home based intervention….community dwelling…*	Complete *A volunteer feeding assistance program …*

		as well as; 3. The study type *Example*: Randomised Control Trial (RCT)		
2.	**WHY**	The study includes rationale for why: description of the rationale, theory or goal towards providing the nutritional intervention in the population and setting described. Justification using evidence from literature. 1. The particular nutritional intervention selected is beneficial to the specific population targeted within the aims of the study. *Example*: Older patients have a higher prevalence of malnutrition which may be due to a lack of feeding assistance, therefore assistance with feeding was provided for the duration of the study. and 2. The healthcare professionals are an essential part of the intervention. *Example*: Most research has reported common themes of staff shortages, but attention by HCPs to patient meal times can have a positive effect on patient eating habits.	Page 2 Partial *Justification for physical activity not nutrition	Page 1 Complete *Description of barriers and priorities for nutrition intervention
3.	**WHAT** **Materials**	Materials: Description of materials used for intervention delivery (physical or informational materials). Includes materials provided to participants in the intervention delivery or for training of HCPs. Details of what the materials consisted of (able to replicate) and where accessed (e.g. appendix, protocol, URL). <u>The study contains information about the</u>: **1.** production (what the material consisted of and who produced the material) **and** **2.** availability (a reference to where the material can be accessed) of the material (physical or informational) used to deliver the nutritional intervention to <u>participants</u>. *Example*: The booklet provided to participants was produced by BAPEN and developed for this particular study. The booklet can be accessed from: [URL link].	Kapan page 3 Protocol page 4 *Example:* Booklet: designed by nutritional scientists discussed fluid intake, anima & plant protein intake & energy intake. discussed 7 nutrition related messages (with goal setting section and tools for self-efficacy reinforcement).	Non described

		and **3.** production (what the material consisted of and who produced the material) **and** **4.** availability (a reference to where the material can be accessed) of the material (physical or informational) used to deliver the nutritional training to <u>professionals</u> (volunteers, HCPs or carers).		
4.	**WHAT Procedures**	Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities. Should be replicable: what was provided and how the nutritional intervention was carried out, goals of intervention , role of HCP and how it was delivered by the HCP and tasks performed. The study contains information about: 1. What was provided to deliver the nutritional intervention. *Example*: Volunteers assisted nutritionally vulnerable patients during mealtimes. **and** 2. How the procedures were carried out by the professional or volunteer. *Example*: The volunteers tasks included opening food and beverage packets, removing lids, making drinks, opening supplements, moving the meal tray closer, rearranging the meal tray, feeding patients[1]. <u>Note</u>: Where the intervention is qualitative, the methods of evaluation are provided. *Example*: Observations were made a dietitian.	Protocol page 4 Complete …' Buddies visit malnourished frail older persons twice a week for approximately one hour and they perform nutritional and physical activity interventions' 1. Details of nutritional activities- food cards, healthy life plate, portfolio of topics 2. Details of physical intervention	Complete feeding assistance, meal tray set up, opening packages, encouragement and conversation

[1] For qualitative study designs, the TIDieR checklist items are applied onto the intervention that is being investigated qualitatively (e.g. item refers to description of the 'intervention' procedures being observed by the dietitian).

5.	**WHO PROVIDED**	For each category of intervention provider (e.g. psychologist, nursing assistant): Description of which HCP provided the intervention, their expertise, background (lay volunteers versus registered nurses), role , description of any recruitment procedures and training provided. The study contains information about: 1. Who trained the professional or volunteer and what their expertise is *Example*: The volunteers were trained by a dietitian **and** 2. The duration and frequency of training sessions *Example*: The volunteers underwent two 1 hr training sessions **and** 3. How professionals were recruited *Example 1*: The volunteers were recruited through a volunteer feeding assistance program Example 2: For studies involving HCPs, the *description of recruitment from the intervention setting (Item 7) is provided (e.g. nurses from the hospital ward)*	Kapan Page 3 Protocol page 5 Complete (Kapan et al., 2017)- description of volunteer inclusion criteria, training programme: *Trained by project team on basic knowledge of aging, fraility, & malnutrition, nutrition related aspects, strength training & psychological issues*	None described (no details of volunteers)
6.	**HOW**	The study: 1. describes the mode of delivery of the intervention *Example*: Face-to-face **and** 2. states whether the intervention was provided to participants individually or in a group	Page 3, Kapan Complete Home visits, face-face	Page 2 Complete face-face assistance to patients
7.	**WHERE**	Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features. The study contains information about the setting in which the intervention was delivered. *Example*: At home, in a hospital.	Page 2, Kapan complete Home	Page 2 Complete Hospital
8.	**WHEN and HOW MUCH**	Details of intervention duration and schedule. Describes the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose (#sessions/duration/hours). The study describes:	Page 3 , Kapan Complete Buddies visited both PTN and SoSu groups	Page 2 Partial 45 min on two weekdays (Thurs & Fri)

		1. The number of times the intervention was delivered *Example*: Twice per week **and** 2. The duration of each session/visit *Example*: 1 hour **and** 3. Over what period of time the intervention was delivered *Example*: For 12 weeks	2xs/wk for 1 hr/session for 12 wks total. (assumption split time between nut and PA)	*not clear if volunteers are routine or just during study time, what about other days?
9.	**TAILORING**	If the intervention was planned to be personalised, individualized adapted, then describe what, why, when, and how. If the intervention was planned to be personalised, explanation is given as to whether the intervention was tailored to the setting or the individual. If the intervention was not tailored, score as 'none'.	Protocol page 4 Complete	Page 2 Partial *no description of the process of feeding assistance
10.	**MODIFICATIONS**	If the intervention was modified during the course of the study, describe the changes (what, why, when, and how). Descriptions of study level modifications such as change in circumstance. E.g. modification in who provided intervention or in material provided If the intervention was not modified, score as 'none'.	n/a (non but not needed)	n/a (non but not needed)
11.	**HOW WELL planned**	*Planned*: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them. Planned adherence to intervention, any monitoring methods to measure compliance: With regards to the intervention, the study contains information about: 1. What was used to measure adherence *Example*: Number of visits **and** 2. The person(s) who took these measurements *Example*: dietitian, nurse, trained volunteer	None described	None described

		and 3. For how long adherence was measured *Example*: For the duration of the study *E.g*. Adherence to the intervention was assessed by means of measurement of dietary intake to assess compliance (e.g. food charts , meal plates, protein intake measurements/records) and by who (Profession, trainer, committee). In cases where HCPs were 'observed' performing task – details of timing and how observations will be assessed recorded		
12.	**HOW WELL actual**	Actual: If intervention adherence or fidelity was assessed, the study describes the extent to which the intervention was delivered as planned. *Example*: Forms were completed outlining what assistance was provided and approximately how much of the meal was eaten	Missing	Page 3 Partial *reporting of E intake measurement and surveys but not in context of adherence

Appendix 9: Evaluation of the reporting quality of nutritional interventions for each study according to the TIDieR Checklist items

Study ID	Item1: Brief name	Item 2: Rationale	Item 3: What materials	Item 4: What procedures	Item 5: Who provided	Item 6: How	Item 7: Location	Item 8: When and how much	Item 9: Tailoring	Item 10: Modifications	Item 11: How well adherence (planned)	Item 12: How well adherence (actual)
Volunteers												
Kapan et al.2017	Partial	Partial	complete	complete	complete	complete	complete	complete	partial	none	missing	missing
Walton et al 2008	complete	complete	missing	complete	missing	complete	complete	partial	none	none	missing	missing
McHugh Power et al.2016	Partial	complete	complete	complete	partial	complete	complete	complete	none	none	complete	partial
Huang et al. 2015	partial	complete	missing	complete	partial	complete	complete	partial	none	none	missing	missing
Howson et al 2018	partial	complete	partial	partial	complete	complete	complete	partial	none	none	missing	missing
Laforest et al 2007	partial	partial	complete	complete	complete	complete	complete	partial	complete	none	missing	missing

Manning et al 2012	partial	complete	missing	complete	missing	complete	complete	partial	none	none	missing	missing
Roberts et al 2017	partial	complete	missing	complete	partial	complete	complete	partial	none	none	missing	missing
Roberts et al 2014	partial	complete	partial	complete	partial	complete	complete	complete	none	none	missing	missing
Robison 2014	complete	complete	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Ottrey et al 2018	partial	complete	missing	complete	missing	complete	complete	partial	none	none	missing	missing
Robinson et al 2002	missing	complete	partial	complete	complete	complete	complete	partial	none	none	missing	missing
Buys et al 2014	partial	complete	missing	partial	complete	complete	complete	complete			partial	partial
Brown 2009	partial	complete	partial	complete	complete	complete	complete	partial				
Wong et al 2008	missing	complete	partial	complete	missing	complete	complete	partial	none	none	missing	missing
Wright et al 2008	partial	complete	partial	complete	partial	complete	complete	complete	complete	none	missing	missing
Sneedon 2011	partial	complete	partial	complete	partial	complete	complete	missing	none	none	missing	missing
HCPS												

Casals et al 2015	partial	complete	missing	complete	missing	complete	complete	partial	complete	none	missing	missing
Poulsen et al 2006	partial	complete	missing	complete	complete	complete	complete	partial	complete	none	missing	missing
Chen et al 2016	partial	complete	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Chang et al 2005	partial	complete	partial	complete	complete	complete	complete	partial	none	none	missing	missing
Suominen et al 2007	partial	complete	partial	complete	complete	complete	complete	partial	complete	none	missing	missing
Young et al 2013	partial	complete	missing	complete	partial	complete	complete	partial	none	none	complete	missing
Pedersen et al 2011	partial	complete	partial	complete	complete	complete	complete	partial	none	none	missing	missing
Holst et al 2017	partial	complete	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Lorefalt et al 2011	partial	complete	partial	complete	complete	complete	complete	partial	complete	none	missing	missing
O"Lassen et at 2008	partial	complete	partial	complete	complete	complete	complete	partial	none	none	missing	missing
Olsson 1998	partial	complete	partial	partial	partial	complete	complete	partial	complete	none	missing	missing

Hollingsworth et al 2016	partial	complete	partial	complete	complete	complete	complete	complete	none	none	missing	missing
chen et al 2019	complete	complete	partial	complete	partial	complete	complete	partial	none	none	partial	partial
Hickson et al 2004	complete	complete	partial	complete	partial	complete	complete	complete	complete	none	missing	missing
O'LASSEN et al 2004	partial	complete	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Palvenen et al 2014	partial	complete	missing	complete	partial	complete	complete	partial	none	none	partial	complete
Wikby et al 2009	partial	partial	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Zho et al 2016	partial	partial	missing	complete	partial	complete	complete	partial	none	none	missing	missing
Carers												
Kurz et al 2010	partial	complete	partial	missing	partial	complete	complete	partial	none	none	missing	missing
Salva et al 2011	partial	complete	partial	complete	partial	complete	complete	partial	none	none	missing	missing
Riviere et al 2001	partial	complete	partial	missing	complete	complete	missing	missing	none	none	missing	missing

Toseland et al 2010	partial	complete	missing	missing	partial	complete	complete	partial	none	none	missing	missing
Glanz et al 1985	partial	complete	partial	missing	complete	complete	complete?	missing	none	none	missing	missing
Hyland et al 2007	partial	complete	partial	missing	complete	complete	missing	missing	none	none	missing	missing
Leggo et al 2008	missing	partial	missing	partial	partial	complete	complete	partial	complete	none	missing	missing
Laque et al 2004	partial	partial	missing	partial	missing	complete	complete	partial	none	none	complete	complete
Johnson et al 2010	partial	complete	missing	missing	partial	missing	missing	partial	none	none	missing	missing
Masud et al 2009	partial	complete	missing	complete	partial	complete	complete	partial	none	none	missing	missing

Chapter 5 Appendices

Appendix 10: Descriptions of multifactorial and multicomponent intervention studies which include nutritional interventions for the prevention of falls and falls related risk factors within the community (n=12)

Study ID	Study Type & Population	Description of Interventions	Outcomes
(Palvanen et al., 2014)	RCT, Finland Home dwelling 70+ years attending falls 'chaos' clinic I: n=661; C: n=653	Multifactorial, individualized 12-month falls prevention programme: Strength and balance training, medical review and referrals, medication review, proper nutrition (calcium, vitamin D), and home hazard assessment and modification **Nutrition**: Promotion of healthy diet including adequate calcium (1000–1500 mg per day) and vitamin D (600–800 IU per day) intake; supplements were recommended and prescribed, 'if necessary' 12-month follow up at 3 and 9 months, and at the follow-up visit at the Clinic at 6 and 12 months. Intervention adherence checked at each contact and booster intervention provided if necessary	Rate of falls & incidence rate ratio (IRR): I: 95 falls per 100 person-years; C: 131 falls per 100 person-years ; IR: 0.72 (95% confidence interval (CI) 0.61–0.86, p < 0.001, NNT 3). The hazard ratio (HR) of I vs C: 0.78 (95% CI 0.67–0.91, p = 0.001, NNT 6) Fall-induced injuries IRR I vs C: 0.74 (95% CI 0.61–0.89, p = 0.002, NNT 5) Fractures IRR I vs C: 0.77 (95% CI, 0.48–1.23; p = .276)
(Fairhall, 2014(Fairhall et al., 2014)	RCT, Australia Community dwelling 'frail' 70+ years identified at discharge from rehabilitation & aged care services I:120; C:121	12-month multifactorial intervention delivered by an interdisciplinary team (two physiotherapists, a geriatrician, rehabilitation physician, dietician and nurse), individualized based on CGA and CHS frailty criteria 10 physiotherapy visits –home hazard, mobility & safety assessments, strength & balance training, referral to OT if needed Medical management- medication review and management of chronic health conditions, referred to a continence clinic if needed.	Mean age: 83 years Between I vs C mean group differences: PPA falls risk score: −0.40 (−0.83 to 0.04, P = 0.07) PPA components of quadriceps strength: 1.84 kg, 95% CI 0.17–3.51, P = 0.03) Body sway (−90.63 mm, 95% CI −168.6 to −12.6, P = 0.02) SPPB (1.58, 95% CI 1.02–2.14, P ≤ 0.001)

		Nutrition assessment and management: Participants who met the weight loss CHS frailty criterion (unintentional weight loss exceeding 4.5 kg in the past year) underwent nutritional assessment and management at home. Home delivered meals if appropriate clinical criteria apply. Nutritional supplementation will be offered using commercially available, high energy, high protein supplements if BMI<18.5 or MUAC 10th percentile (using Australian age and gender specific norms) Outcomes assessed at baseline, at three and 12-months	Gait speed (0.06 m/s 95% CI 0.01–0.10, P = 0.02) No difference in fall rates (incidence rate ratio 1.12, 95% CI 0.78–1.63, P = 0.53)
(Markle-Reid et al., 2010)	RCT, Canada Community dwelling 75+ years, at risk of falls & referred for home support services I:49 C: 43	6 month multifactorial individualised intervention, home visits by interdisciplinary (case manager, RN, OT, PT, RD) at least 1x/month Intervention, falls prevention plan: Home support exercise program, Advice to consider vitamin D and calcium supplementation, Medication review and modification, continence assessment, referral to GP, education on pelvic floor exercises, Nutrition assessment, referral to dietician, Cognitive assessment, referral to physician or community mental health services, Home hazard assessment with home modifications and recommendations **Nutrition assessment:** If poor nutrition or weight loss: nutrition education, referral to dietitian for further assessment and treatment; Consider calcium and vitamin supplements	Age range: 75 to 84 years I vs C mean difference: number falls at six months of falls (–0.31 vs. –0.35, difference: 0.04, 95% CI: –1.18 to 1.27) Mean number of slips or trips –0.53 vs 4.44 in the usual-home-care group, difference: –4.97, 95% CI: –10.78 to 0.84 (p = 0.03) No difference between the two groups in the number and type of fall-related injuries
(Imhof et al., 2012)	RCT, Switzerland Community dwelling 80+ years	9-month in-home HCP delivered (nurses- APN): 4 home visits after 4, 12, 24, and 36 weeks and 3 telephone calls after 8, 18, and 30 weeks Individualised, multifactorial intervention: customized to the participants' needs using evidence-based guidelines regarding prevalent health concerns such as mobility, vision and hearing,	Mean age: 85 years Relative Risk I vs C: Self-reported acute events: (116 vs 168, relative risk (RR) = 0.70, P = .001) falls (74 vs 101, RR = 0.71, P = .003)

	I: n=231 C: n=230	pain, nutrition, cognitive abilities, and bladder control, social support and case management **Nutrition assessment:** BMI and MNA screening recorded Outcomes measured at baseline, 3, 6, 9 months	consequences of falls (e.g. fractures) (63.1% vs 78.7%, chi-square = 7.39, P = .007) Hospitalizations (47 vs 68, RR = .70, P = .03)
(Luck et al., 2013)	RCT, Germany Community dwelling 80+ years , functional impairment in 3 criteria of ADL I: n=118; C: n=112	18 month individualised intervention: 1st home visit multidimensional geriatric assessment (first preventive home visit) of self-care deficits and risk factors for institutionalization: including those that are also associated with falling (eg, impairment in vision, age-inappropriateness of housing conditions, or malnutrition 2nd MDT case conferences (eg, nutritionist, nurse scientist, psychologist, gerontopsychiatrist) analysed the identified self-care deficits and risk factors and compiled individualized interventions and recommendations. When necessary, further experts (eg, nutritionist, social worker) were consulted Recommendations supplemented by falls prevention information: home hazards, balance & gait, options to reduce risk such as shoes, aids, st & balance training, vitamin D supplementation 3rd: second visit 2-3 weeks delivering intervention (including materials if needed) 4th: booster session one month later 5th: Follow up after 18 months **Nutrition**: Nutritional status measured by MNA and nutritional consultation if needed; vitamin D and Calcium supplementation	Mean age: 85 years I vs C number of falls: (2.2 ± 2.5 vs 3.7 ± 4.2; Mann-Whitney *U* test = 662.000; *P* = 0.007) Baseline-Fup in I group IRR: 0.63 (p=0.003) Baseline-Fup in C group IRR: 1.96 p<0.001 No significant difference in ADL between two groups
(Shyu et al., 2010)	RCT, Taiwan I: n=80; C: n=82 Hospital admitted for an	2 year intervention follow up Individualised Interdisciplinary intervention program included geriatric consultation services, a continuous rehabilitation program, and discharge-planning services	Mean age: 78 years I vs C group: Falls rate: (β=−0.57, *P*=.03) Subsequent falls OR: 0.56 (95% CI=0.34–0.94, *P*=.03) Hip flexion: (β=5.43, *P*<.001)

	accidental hip fracture 60+years	Geriatric assessments & consultations: CGA including falls history, nutritional status, medication, examination, perioperative consultation for surgery infection and thromboembolic prophylaxis, postoperative nutrition management, urinary tract management, and delirium prevention and management Continuous rehabilitation: early postoperative rehabilitation, facilitate mobility, plan for hospital discharge, and provide rehabilitation in the patient's usual environment, exercise protocol by nurses and PT The discharge planning component was designed to maintain continuity of care and to assure appropriateness of referrals, home modifications if needed and was delivered by geriatric nurses One geriatrician visit, a mean of 5.4 ± 2.4 geriatric nurse visits, a mean of 3.1 ± 1.6 physical therapist visits, and one rehabilitation physician visit during the hospital stay. At home each participant in the intervention group received an average 9.9 ± 2.3 geriatric nurse visits and an average 3.0 ± 1.1 physical therapist visits **Nutrition**: Nutritional status assessment with CGA; Postoperative nutritional management Outcomes measure: 3, 6, 12, 18, 24 months	ADLs (β=9.22, P<.001), recovery of walking ability (odds ratio (OR)=2.23, P<.001) SF-36 physical summary scores (β=6.08, P<.001) No significant differences in mortality or service utilisation
(Campbell & Robertson, 2006)	RCT, New Zealand Community dwelling 75+ with poor vision recruited from outpatient clinics and	12 month Intervention Home safety assessment and modification programme by OT (n = 100), an exercise programme prescribed at home by a physiotherapist plus vitamin D supplementation (n = 97), both interventions (n = 98), or social visits (n = 96) PT home visits: five home visits at weeks one, two, four, and eight and a booster visit after six months	Mean age: 84 years Home safety programme vs in the exercise programme only (incidence rate ratios 0.59 (95% confidence interval 0.42 to 0.83) and 1.15 (0.82 to 1.61), respectively). Exercise programme, stricter adherence was associated with fewer falls (P = 0.001)

	ophthalmology practice	**Nutrition**: PT delivered vitamin D tablets (two 1.25 mg calciferol tablets initially and then one monthly for one year) to those not already taking this supplement	
(Mendoza-Ruvalcaba & Arias-Merino, 2015)	RCT, Mexico Community dwelling 60+ years, recruited from senior centers I: n=31; C: n=33	Intervention: 2 months, 6 months follow up 'I am Active' programme": 2-hour group sessions, 2x/week (total of 16 sessions) Physical activity, nutrition, and cognitive functioning, and seeks to promote better quality of life Initial activity 'daily news' & 30 min physical activity (i.e strength & balance) & presentation on an issue (i.e nutrition) **Nutrition sessions**: general concepts were reviewed, along with truth and fiction about nutritional facts, healthy proportions of each of the principle food groups and types of nutrients, and good eating behaviours <u>Nutrition Sessions: (x8)</u> About Nutrition, Eating well, Fruits & Veg, Meat, fish and seafood, Grains, breads and cereals, Milk, Fats, oils and sweets, My own nutritional plan	Mean age: 70 years I vs C group mean (SD) post-test: lower risk of falls (28.06 (5.31) vs 26.87(5.87) P<0.05, d=034) *declined at follow up Improved balance (21.84 (3.63) vs 20.33(2.63) (P<0.05), d=41) Improved arm flexibility: 158.03 (13.49) vs 141.67 (20.73) p<0.05; d=65) Improved cognitive performance on processing speed & memory(P<0.001) Improved nutrition self efficacy (P<0.01) Nutritional status: I: 29.0 % vs C: 57.6% at risk of malnutrition (p<0.05) Improved QOL (I: 26.80 (2.37) vs 24.75 (3.17) (p<0.01) No effects of the program were seen in measures of gait and grip strength in either group
(Neelemaat et al., 2011; Neelemaat et al., 2012)	RCT, The Netherlands 60+, malnourished, hospital admitted & 3 months post discharge	Intervention: Energy- and protein-enriched diet (during the in-hospital period) +ONS (x2) + vitamin D supplements+ telephone counselling post discharge Measurements at baseline hospital admission + after 3 months Standardized nutritional support starting in the hospital and continuing for 3 months after discharge. 1) Energy- and protein-enriched diet providing approx. 750 kcal and 30 g of protein more per day than the regular hospital menu	Mean age:75 years BMI<20.0: I: 55%, C:53% I vs C Three months after discharge: Number of fallers Hazard Ratio: HR = 0.41, 95% confidence interval (CI) = 0.19–0.86).

	I: n=105; C: n=105	→whole milk products, butter or margarine, and energy-and protein-enriched oatmeal and desserts, fortified oatmeal & dessert, and one energy- and protein-enriched snack (2) Two additional servings per day of an ONS . → additional 600 kcal, 24 g of protein, 176 IU of vitamin D3, and 364 mg of calcium/day. ONS were first dispensed for 2 weeks (2 bottles per day × 14 days = 28 bottles) and subsequently for 4 weeks (2 bottles per day × 28 days = 56 bottles) ordered and followed up by dietitian (3) 400 IU vitamin D3/day, as combined calcium and vitamin D supplement (400 IU vitamin D3 and 500 mg calcium per day (4) Telephone counselling by a dietitian every other week post discharge (six sessions in total). Assessed general health status and any difficulties with the prescribed diet and supplements were discussed (adherence, taste)	Energy intake: significantly higher I vs C (280 kcal, 95% CI = 37–524 kcal) and protein (11 g, 95% CI = 1–25 g) Serum 25-hydroxyvitamin D levels: significantly higher I vs C (10.9 nmol/L, 95% CI = 2.9–18.9 nmol/L) *No statistical difference in BMI changes, PA, HGS, fat free mass or falls incidences
(Ng et al., 2015)	RCT, Singapore Community dwelling , pre frail or frail , 65+ years	5 interventions of 24 weeks duration each: 1) Nutritional supplementation (n=49) 2) cognitive training (n=50): 2 hr weekly sessions for 12 wks + booster sessions for 12 wks to stimulate ST memory, increase attention information-processing skills, and reasoning and problem-solving abilities 3) physical training (n=48): qualified trainer provided st & balance group training 90 min 2x/wk for 1 wks + 12 wks home exercises 4) combination treatment (n=49): all three interventions 5) and usual care control (n=50) **Nutritional supplementation:** A commercial ONS formula + iron & folate supplement + vitamin B6 and vitamin B12 supplement + calcium and Vitamin D supplement	Frailty score: significantly higher reduction of score vs control in the nutritional (odds ratio [OR] 2.98), cognition (OR 2.89), and physical (OR 4.05) and combination (OR 5.00) intervention groups. Improvements in physical frailty domains (associated with interventions) were most evident for knee strength (physical, cognitive, and combination treatment), physical activity (nutritional intervention), gait speed (physical intervention), and energy (combination intervention). For physical activity, the nutrition group alone showed the largest significant increase at 6 months and 12 months

		taken daily for 24 weeks, which was designed to augment caloric intake by about 20% and provide about one third of the recommended daily allowances of vitamins and minerals. encouraged to attain the maximal tolerable energy intake to gain 0.5 kg per week	
(Serra-Prat et al., 2017)	RCT, Spain Community-dwelling pre-frail older people (≥70 years) consulting in primary care I: n=61; C: n=72	12 month-intervention: nutritional and physical activity components (aerobic exercise walking 30-45 min 4x/wk+ st & balance at home 4x/wk for 20-25 min) **Nutrition component:** Individuals in the intervention group were screened for malnutrition using the Short-Form Mini Nutritional Assessment questionnaire (MNA-sf) and those at risk were referred to the Nutritional Unit for further assessment, follow-up and the establishment of the usual dietary recommendations and corrective measures	Mean age: 78.3 years MNA-sf score: I: 86% well nourished, 11% at risk of malnutrition, 23% malnourished; C: 94% well, 6% at risk, 0% malnourished Frailty score significantly less I vs C: adjusted OR 0.19 (95% CI: 0.04–0.95; P = 0.044) Walking/hr/day: significantly higher in I vs C: (0.97 versus 0.73; P = 0.019) no difference was observed in muscle strength, gait speed or other functional indicators
(Uusi-Rasi et al., 2015, 2017)	RCT, Findland Community dwelling females 70-80 years old, at least 1 fall in previous year , no use of Vit D supplements	2-year intervention: vitamin D + exercise allocated in 4 study groups Placebo + no exercise, vitamin D (800IU/d) + no exercise, placebo + exercise, vitamin (800Iu/d) + exercise Exercise consisted of group training classes 2x wk for first 12 months then 1x per week second 12 months led by PT **Nutrition**: Participants received one daily pill containing 800 IU (20 µg) of vitamin D3 for 24 months	Hazard ratios for injured fallers were significantly lower among exercisers with vitamin D (0.38; 95% CI, 0.17-0.83) and without vitamin D (0.47; 95% CI, 0.23-0.99). Vitamin D significantly maintained femoral neck bone mineral density and increased tibial trabecular density

	N=409 total		Exercise significantly improved walking speed, muscle strength and balance. Vitamin D did not enhance exercise effects on physical functioning

Appendix 11: Falls survey questionnaire

Please complete this survey if you are a healthcare professional working within a falls service in England (one survey per falls service).

Part 1: Nutritional care and procedures

1) **Does your falls service have a written nutritional care policy?**
   ☐ Yes ☐ No ☐ Don't know

2) **Are there routine nutrition screening procedures in place for clients using your service?**
   ☐ Yes ☐ No ☐ Don't know

3) **If yes:**
   a. **Is a nutrition screening tool routinely used? e.g. Malnutrition Universal Screening Tool (MUST)**
   ☐ Yes ☐ No ☐ Don't know
   ☐ Other procedure, please specify _____
   b. **If yes, which tool is used?** _____

   c. **Who performs nutrition screening in your service and how often?** *(Select all that apply)*

	At first visit	*At follow up visits*	*Weekly*	*Monthly*	*Occasionally*	*Never*	*Don't know*
Physician							
Nurse							
Pharmacist							
Physiotherapist							
Occupational Therapist							
Dietitian							
Health care assistant							
Other (please specify)							

   d. If nutrition screening is **not** routinely repeated after first contact with your service, do you have written criteria for when to re-screen?

☐ Yes ☐ No ☐ Don't know

If yes, please list the criteria below:

4) **Which of the following nutrition related procedures are routinely provided to clients using your service?**
(Select all that apply)

	At first visit	*At follow up visits*	*Weekly*	*Monthly*	*Occasionally*	*Never*
Weight measured						
Height measured						
Body Mass Index (BMI) calculated						
Dietary intake assessed						
Nutritional assessment completed						
Nutrition advice and counselling provided						

Please describe any other routinely performed nutrition-related procedures (and frequency) below:

5) **Are the nutrition procedures routinely recorded in client records?**
☐ Yes ☐ No ☐ Don't know

6) **If yes, how are the records accessed in other healthcare settings within your local area (e.g. between services: Trusts, primary care, GP)?**
(Select all that apply)
☐ Electronic platform
☐ Email
☐ Post
☐ Other , please specify_____

7) **Is nutrition information routinely documented on discharge from your service?**

☐ Yes ☐ No ☐ Don't know

8) **If yes, who is information routinely sent to?**

(Select all that apply)

☐ GP ☐ Nurse ☐ Consultant ☐ Client

☐ Other, please specify_____

9) **If yes, how is this information circulated?**

(Select all that apply)

☐ Electronic platform ☐ Post ☐ Clinic letter

☐ Pro forma

☐ Other, please specify_____

10) **Are dietitians involved in the nutritional care of people in your falls service?**

(Select all that apply)

☐ Yes ☐ No ☐ Don't know

11) If yes:

a. ***please provide information on how dietitians are involved in your service***

☐ Part of the falls clinical team

☐ Accessed through referral to local dietetic services

☐ Other , please specify_____

b. **What is the Dietitian(s)' Agenda for Change pay Band? (for NHS only)**

☐ Band 2-4 ☐ Band 5 ☐ Band 6 ☐ Band 7 ☐ Band 8a

☐ Band 8b ☐ Band 8c ☐ Band 8d ☐ Band 9 ☐ Don't Know

c. **What is the amount of time the dietitian is contracted to the falls service?**

Please specify (hours/days/week): _____

☐ Don't Know

d. **How is the dietetic post funded?**

Please describe below:

_____

☐ Don't Know

e. What types of contact do your clients have with dietitians??
(Select all that apply)
f.

☐ Face-face in clinic ☐ Home visits ☐ Group sessions ☐ Telephone
☐ Don't Know ☐ Other (please specify)
_____

12) Who is involved in providing written information regarding nutrition to your clients?
(select all that apply)

	Physician	*Nurse*	*Dietitian*	*Physio-therapist*	*Self-service*	*Other (please specify)*
Diet plan or individualized nutritional advice						
Falls specific leaflet or booklet including nutrition information						
General leaflet or booklet including nutrition information						
Verbal information only						
No nutritional information provided						
Other (please specify)						

Part 2: Falls Service Demographics

13) Where is your service located?

☐ North West England ☐ North East England ☐ Yorkshire ☐ East Midlands

☐ West Midlands ☐ East of England ☐ London ☐ South East England

☐ South West England ☐ Wales ☐ Northern Ireland

14) Which care settings does your service cover? *(Select all that apply)*

☐ Hospital ☐ GP or primary care ☐ Rehabilitation facility

☐ Community ☐ Sports facility ☐ Care Home

☐ Other, please specify _____

15) Which of the following healthcare professionals are contracted to your falls service team?

(Select all that apply)

Profession	**1 post**	**2 posts**	**3 posts**	**4 posts**	**5 posts**	**>5 posts**
Physician						
Nurse						
Physiotherapist						
Occupational Therapist						
Dietitian						
Psychologist						
Other (please specify)						

If known, please enter whole time equivalents for each post

_____

16) If not contracted to your team, are there clear referral procedures?

(select all that apply)

Profession	**Yes**	**No**	**Not Applicable**
Physician			
Nurse			
Physiotherapist			
Occupational Therapist			
Dietitian			
Psychologist			
Other (please specify)			

17) Are there any other professionals that make up your team? Please specify:

18) Which interventions are routinely provided within your falls service?
(Select all that apply)

☐ Medical / clinical care
☐ Exercise
☐ Prescription of oral nutritional supplements (ONS)
☐ Nutrition counselling
☐ Medication
☐ Prescription of vitamin and/or mineral supplements (please specify)

☐ Psychological support
☐ Environment/assistive technology
☐ Other, please specify _____

19) How and by whom is your Falls service funded?
Please describe below:

_____
___

☐ Don't know

20) What is your role in the falls service (occupation)?
☐Physician ☐ Nurse ☐ Physiotherapist ☐ Occupational Therapist
☐ Dietitian ☐ Pharmacist ☐ Administrator
Healthcare assistant
☐ Other, please specify _____

21) Do you have any other comments regarding nutrition in your falls service?
Please comment below:

Thank you for completing this survey, your contribution is much appreciated.

Appendix 12: Additional falls service comments reported

Additional falls service comments reported (n=14)	
Topic	**Example comments**
Nutritional information provided (n=6)	• *'advice varies dependent on patient needs and who is involved in their care'(n=1)* • *'advice would depend on initial MUST assessment' (n=1)* • *'written and verbal information is in relation to fluids rather than other nutritional aspects'(n=1)* • *'during group as physiotherapists we mainly advise to keep a healthy diet and hydration' (n=1)* • *patients were referred to a dietitian for nutritional information (n=2)*
Additional falls service comments (n=14)	
Inclusion of dietitian or nutritional care within services (n=6)	• *"We are in the process of reviewing our education sessions and made me wonder if we should reach out to dietitian as part of the program. It would be great to see future guidelines."* • *"I feel compelled to ensure that nutritional care is introduced and forms part of our falls prevention service."* • *"It would be good to have a simple process to include in our assessment template to cover various aspects of nutrition consistently"*
Staff shortages and funding (n=2)	• *'…very small team poorly funded despite the evidence of the importance of a falls service.'*
Other subjective nutritional assessment procedures (n=2)	• *'…if we had concerns regarding weight loss or nutritional intake…MUST is completed, info leaflet provided and referral to dietician is actioned if indicated by MUST. We rarely revisit MUST at later visits.'*
Training (n=1)	• *"We have been commissioned to provide training to care home staff and this includes approx. 1 1/2 hours nutrition training on fluid & weight loss/MUST."*

NHS
Health Research Authority
North West - Haydock Research Ethics Committee
3rd Floor - Barlow House
4 Minshull Street
Manchester
M1 3DZ

Telephone: 0207 104 8021

05 July 2019

Dr Elizabeth Weekes
Department of Nutrition and Dietetics
Guy's and St. Thomas' NHS Foundation Trust
Westminster Bridge Road
SE1 7EH

Dear Dr Weekes

Study title:	**Perceptions of nutritional management by multidisciplinary health professionals and patients and the co-design of intervention strategies for nutritionally vulnerable older people utilising falls prevention services**
REC reference:	**19/NW/0288**
Protocol number:	
IRAS project ID:	**260613**

Thank you for your submission, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Mental Capacity Act 2005

I confirm that the committee has approved this research project for the purposes of the Mental Capacity Act 2005. The committee is satisfied that the requirements of section 31 of the Act will be met in relation to research carried out as part of this project on, or in relation to, a person who lacks capacity to consent to taking part in the project.

Conditions of the favourable opinion

The REC favourable opinion is subject to the following conditions being met prior to the start of the study.

Confirmation of Capacity and Capability (in England, Northern Ireland and Wales) or NHS management permission (in Scotland) should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements. Each NHS organisation must confirm through the signing of agreements and/or other documents that it has given permission for the research to proceed (except where explicitly specified otherwise).

Guidance on applying for HRA and HCRW Approval (England and Wales)/ NHS permission for research is available in the Integrated Research Application System.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of management permissions from host organisations

Registration of Clinical Trials

It is a condition of the REC favourable opinion that all clinical trials are registered on a publicly accessible database. For this purpose, clinical trials are defined as the first four project categories in IRAS project filter question 2. For clinical trials of investigational medicinal products (CTIMPs), other than adult phase I trials, registration is a legal requirement.

Registration should take place as early as possible and within six weeks of recruiting the first research participant at the latest. Failure to register is a breach of these approval conditions, unless a deferral has been agreed by or on behalf of the Research Ethics Committee (see here for more information on requesting a deferral: https://www.hra.nhs.uk/planning-and-improving-research/research-planning/research-registration-research-project-identifiers/

As set out in the UK Policy Framework, research sponsors are responsible for making information about research publicly available before it starts e.g. by registering the research project on a publicly accessible register. Further guidance on registration is available at: https://www.hra.nhs.uk/planning-and-improving-research/research-planning/transparency-responsibilities/

You should notify the REC of the registration details. We will audit these as part of the annual progress reporting process.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

After ethical review: Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study, including early termination of the study
- Final report

The latest guidance on these topics can be found at https://www.hra.nhs.uk/approvals-amendments/managing-your-approval/.

Ethical review of research sites

NHS/HSC sites

The favourable opinion applies to all NHS/HSC sites listed in the application subject to confirmation of Capacity and Capability (in England, Northern Ireland and Wales) or management permission (in Scotland) being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Non-NHS/HSC sites

I am pleased to confirm that the favourable opinion applies to any non-NHS/HSC sites listed in the application, subject to site management permission being obtained prior to the start of the study at the site.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Interview schedules or topic guides for participants [Interview Topic Guides]	1.0	10 April 2019
IRAS Application Form [IRAS_Form_12042019]		12 April 2019
IRAS Checklist XML [Checklist_18062019]		18 June 2019
Other [Poster for site informal observations]	1.0	10 April 2019
Other [supervisor 2 CV Baldwin C]	1.0	18 April 2019
Other [Feedback Event Invitation Letter]	1.0	12 June 2019
Other [provisional Outcome Edits]	v1.0	18 June 2019
Participant consent form [Patient consent forms 1 interviews]	2.0	12 June 2019
Participant consent form [Patient consent 2 video release]	2.0	12 June 2019
Participant consent form [Patient consent 3 feedback events]	2.0	12 June 2019
Participant consent form [Patient consent form consultation observation]	2.0	12 June 2019
Participant consent form [Carer consent form 1 interviews]	2.0	12 June 2019
Participant consent form [Carer consent form 2 video release]	2.0	12 June 2019
Participant consent form [Carer consent form 3 feedback events]	2.0	12 June 2019
Participant consent form [Staff consent form]	2.0	12 June 2019
Participant consent form [Staff consent form consultation observation]	2.0	12 June 2019
Participant consent form [Consultee consent form 1 interviews]	2.0	12 June 2019
Participant consent form [Consultee consent form 2 video release]	2.0	12 June 2019
Participant consent form [Consultee consent form 3 feedback events]	2.0	12 June 2019
Participant consent form [Consultee consent for observations]	2.0	12 June 2019
Participant consent form [Consent form regained cap 1 interviews]	2.0	12 June 2019
Participant consent form [consent form regain cap 2 video release]	2.0	12 June 2019
Participant consent form [consent form regained cap 3 feedback events]	2.0	12 June 2019
Participant consent form [consent form regained cap patient consultation observation]	2.0	12 June 2019
Participant information sheet (PIS) [PIS patients]	2.0	12 June 2019
Participant information sheet (PIS) [PIS patients for consultation observation]	2.0	12 June 2019
Participant information sheet (PIS) [PIS carers]	2.0	12 June 2019
Participant information sheet (PIS) [PIS staff]	2.0	12 June 2019
Participant information sheet (PIS) [PIS consultee]	2.0	12 June 2019
Participant information sheet (PIS) [PIS consultee for consultation observation]	2.0	12 June 2019
Participant information sheet (PIS) [PIS regained capacity]	2	12 June 2019
Participant information sheet (PIS) [PIS regained capacity patients for consultation observation]	2.0	12 June 2019
Research protocol or project proposal [Study Protocol]	1.0	10 April 2019

Summary CV for Chief Investigator (CI) [Chief Investigator CV]	1.0	10 April 2019
Summary CV for student [Research Student CV Massar Dabbous]	1.0	10 April 2019
Summary, synopsis or diagram (flowchart) of protocol in non technical language [Study flow chart]	1.0	10 April 2019
Summary, synopsis or diagram (flowchart) of protocol in non technical language [Study Timeline/schedule of procedures]	1.0	10 April 2019

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Learning

We are pleased to welcome researchers and research staff to our HRA Learning Events and online learning opportunities– see details at: https://www.hra.nhs.uk/planning-and-improving-research/learning/

19/NW/0288	**Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project.

Yours sincerely

Dr Tim S Sprosen
Chair

Email:nrescommittee.northwest-haydock@nhs.net

Enclosures: "After ethical review – guidance for researchers"

Copy to: Elizabeth Bruna

Appendix 14: Description of Community Falls Services (CRAFS)

Characteristics of falls services observed and segmentation criteria for service users		
Service	**Location**	**Level***
Falls Clinic	Outpatient	Complex problems & functional dependency
Falls Clinic	Outpatient	
Falls Clinic	Outpatient	
Strength and Balance Class	Outpatient	Cognitive Impairment Decreased motivation Functional dependency
Strength and Balance Class	Community	
Strength and Balance Class	Community	
1:1 Physiotherapy	Community (at home visit)	Cognitive Impairment Decreased motivation Functional dependency
Community Exercise Class	Community centre (1)	Motivated Independent (mobilise unaided/no stick)
Community Exercise Class	Community centre (2)	
1:1 Otago	Community (Field note explanation)	Motivated Independent (mobilise unaided/no stick)
Fall Clinic	Community	Complex problems & functional dependency
**Definition of terms:* *Complex problems: Individual has more than one risk factor for falls (e.g. multimorbidity)* *Functional dependency: Individual has limited strength and balance and mobility, may require assistance by an aid (e.g. walking stick) or dependent* *Motivated: Individual is motivated to improve functional status by taking part in interventions (divided between at home exercises and require attending the service regularly)* *Independent: Individual can mobilise on their own without aid from a person or walking stick to allow to take part in the activities*		

Participant Information Sheet –(Staff)

Perceptions of nutritional management by multidisciplinary health professionals and patients and the co-design of intervention strategies for nutritionally vulnerable older people utilising falls prevention services (CONS-F)

Invitation to take part in this research study.
The current study is being conducted for educational purposes as part of a PhD project within King's College London. I would like you to understand why the research is being done and what it would involve for you, before you decide if you want to take part. I will go through this information sheet with you and answer any clarification questions you may have.

Important things to know

What is the purpose of this study?
We know that nutrition risk is important as people age and this is especially the case around people who experience a fall. We want to improve the services that we provide to these people and in order to improve services we need to understand what is happening at the moment. This study aims to work with both healthcare professionals as well as patients and family members/carers to understand how nutritional care services are experienced and perceived and to co-design strategies for improvement of services in the future, using the Experienced Based Co-Design approach (EBCD).

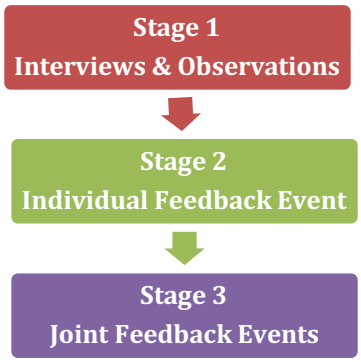
If you choose to take part in this research we want to understand your perceptions around the nutritional management provided within your professional practice.

Why have I been invited?
You have been invited because you are working within the Falls Services provided by Guy's & St Thomas' NHS Foundation Trust, or other services e.g. strength and balance classes, provided by the boroughs of Lambeth and Southwark.

Do I have to take part?
No, it is up to you to decide if you want to take part. Choosing not to be part of the study will not affect you in any way. If you decide to take part, you are still free to withdraw at any time without providing a reason.

Stages of the study

What would taking part involve?
There are three stages in this study that will be conducted throughout one year that you can choose to take part in. You have the option to take part in any individual stage, or in all stages.



Stage 1:

In the first stage of the study, you will be interviewed to discuss your perceptions and experiences surrounding the nutritional management of the older adult population within your practice. We will ask your permission to audio record these interviews which will take place at a private space at King's College London or Guy's and St Thomas' NHS Foundation Trust (GSTT) and last approximately 1 to 1.5 hours. We may also observe your consultation with patients within the Falls Clinic (approximately 2-3). Notes will be made by the researcher, however, your name or any personal identifiable information will not be recorded. Anonymised notes may be used in dissemination activities such as presentations, as well as the final thesis for this study.

Stage 2:

Feedback Event: Meeting other healthcare professionals

We will identify the main themes discussed from the interviews after data analysis and in this stage you will be invited to a feedback event with other healthcare professionals to discuss these themes and your views collectively. The prioritised list of issues needed for improvement of nutritional management will be identified and these will be set for discussion with the patient and carer participants in the next stage. This event will be held at a room at King's College London or within Guy's and St Thomas' Hospital and will last up to 2 hours (details will be provided closer to the event time).

The event will be facilitated by the lead researcher and observations and field notes including possible anonymised quotes will be made by a member of the research team which may be used in dissemination activities such as presentations, as well as the final thesis for this study.

Stage 3:

Joint Feedback Event(s): Meeting with healthcare professionals

This next joint feedback event (known as co-design workshops) will be held together with patient and carers who have also been video interviewed and a film of their crucial moments surrounding their nutritional services within their healthcare journey will be shown. The purpose of this workshop is for service

users, carers and staff to introduce the film discuss the key areas for improvement and work together to co-design strategies to improve nutritional services within falls prevention services.

The 25-30-minute film made and themes from your interviews will be used to facilitate this event by the lead researcher. This event will last up to 3 hours. Observations and notes will be made by the research team which may be used in dissemination activities such as presentations, as well as the final thesis for this study. This event will be held at a room at King's College London or within Guy's and St Thomas' Hospital and may be held as more than one event (details will be provided closer to the event time).

Procedures and supporting Information

Consent procedure(s)

You will be asked to sign a consent form if you agree to participate in the study. Within the consent form, you will be asked your permission to audio-record your interviews and your participation in the following stages of this study (stages above). You may also be asked to sign a separate consent form to observe your consultation.

What are the possible benefits of taking part?

This research study aims to improve future nutritional care provided to people using falls prevention services, however, this study will not provide immediate results for participants taking part.

What are the possible risks of taking part?

We do not anticipate any risk as a result of research activity carried out for this study.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the lead researcher who will answer your questions (Massar Dabbous, Massar.Dabbous@kcl.ac.uk). If you would like to speak to somebody independent of the study, you can contact the Patient Advice and Liaison Service (PALS) at Guy's and St Thomas' NHS Foundation Trust (020 7188 8801or pals@gstt.nhs.uk).

In the event that something goes wrong and you are harmed during the research then you may have grounds for legal action for compensation against Guy's and St Thomas' NHS Foundation Trust but you may have to pay your legal costs. Guy's and St Thomas' NHS Foundation Trust maintains adequate insurance to cover any liabilities arising from the study.

How much time will be taken from my work schedule?

We are aware that taking part in this study will take time from your schedule and we are grateful for your participation. You have the option to take part in an individual stage or all stages of the study. We will try to provide a convenient place and time well in advance for the events to take place. Lunch/snacks and other refreshments will be provided at all the events. We hope this research

study aims to improve nutritional services provided through joint patient, carer and healthcare staff involvement.

What will happen if I don't want to carry on with the study?
You can choose to withdraw from the study at any time without providing a reason and this will not disadvantage you in any way. Your pseudo-anonymised data will be used up until the point of withdrawal.

What will happen to the results of the research?
The study will be written up as part of a PhD thesis (by Massar Dabbous) and may be published in scientific journals and presented at healthcare conferences. The results may also be used for future educational and service improvement purposes within King's College London and Guy's and St Thomas' NHS Foundation Trust (e.g. shared with other healthcare professionals). You will not be identified in any report and pseudonyms will be used to maintain your confidentiality.

Who is organising and funding this research?
The research is part of a PhD study for the lead researcher Massar Dabbous at the Department of Diabetes and Nutritional Sciences, King's College London. The research is being supervised by Dr. Elizabeth Weekes and Dr. Christine Baldwin.

Has the research been reviewed by an appropriate research ethics committee?
All research in the NHS is looked at by an independent group of people called the Research Ethics Committee to protect your interests. This study has been reviewed and given favourable opinion by the North West-Haydock Research Ethics Committee.

Confidentiality and data protection

Will my information be kept confidential?

Your collected data will be processed in accordance with the General Data Protection Regulation (GDPR). The data collected for the study will be analysed to learn more about perceptions of nutritional management of patient and carers and improve nutritional services.

Confidentiality will be maintained by the research team who will only have access to identifiable information (e.g. names, contact details) that you provide. Identifiable information and audio recordings, will be kept separately to other data in locked cabinets at King's College London and/or Guy's and St Thomas' NHS Foundation Trust and a secure password protected database will be maintained by the lead researcher stored on a secure server at King's College London and/or Guy's and St Thomas' NHS Foundation Trust.

Transcription of the recordings will be pseudo-anonymised and will not include your name and used only for the purpose of this research, and teaching within King's College London or Guy's and St Thomas' NHS Foundation Trust (as per your consent). You will not be identifiable from any quotes used from your

interview. The audio tapes of the interview will be destroyed once they have been transcribed and analysed by the research team (by December 2020).
The lead researcher, Massar Dabbous and chief investigator Dr. Elizabeth Weekes will be responsible for security and access to the data.

Data protection statement
Guy's and St Thomas' NHS Foundation Trust is the sponsor for this study based in the United Kingdom. We will be using information collected from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Guy's and St Thomas' Foundation Trust will keep identifiable information (e.g. names, contact details) about you 1 year after the study has finished (until September 2022). Additionally, any non-identifiable data collected will be secured for a further five years after study completion in keeping with standard research practice of Guy's and St Thomas' NHS Foundation Trust, before being destroyed as confidential waste.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible. You can find out more about how we use your information on the link below.
https://www.guysandstthomas.nhs.uk/research/patients/use-of-data.aspx

A code system is used to pseudoanonymise your data and the key is kept confidential and not disclosed to the sponsor, except where the sponsor is also the site. Guy's and St Thomas' NHS Foundation Trust and King's College London will keep your name, contact details, and other personal identifiers provided confidential. Guy's and St Thomas' NHS Foundation Trust and King's College London will use this information as needed, to contact you about the research study, and make sure that relevant information about the study is recorded for your care, and to oversee the quality of the study. Certain individuals from Guy's and St Thomas' NHS Foundation Trust and regulatory organisations may look at your medical and research records to check the accuracy of the research study.

What happens if you would like more information about the study?
If you would like to ask any questions or receive more information about the study, please contact us on:

Email: Massar.Dabbous@kcl.ac.uk
Address: King's College London,
Department of Nutritional Sciences
Faculty of Life Sciences and Medicine
Room 4.103 Franklin-Wilkins Building
150 Stamford Street
London SE1 9NH
Phone: 074643938

Appendix 16: Participant Information Sheet (service user)

Participant Information Sheet - (Patient)

Perceptions of nutritional management by multidisciplinary health professionals and patients and the co-design of intervention strategies for nutritionally vulnerable older people utilising falls prevention services (CONS-F)

Invitation to take part in this research study.

The current study is being conducted for educational purposes as part of a PhD project within King's College London. I would like you to understand why the research is being done and what it would involve for you, before you decide if you want to take part. I will go through this information sheet with you and answer any clarification questions you may have. Please feel free to discuss the study with your friends or relatives if you wish to.

Important things to know

What is the purpose of this study?

We know that it is important to eat well and to maintain a healthy weight as you age and this is especially the case if you have had a fall. We also know that some people experience difficulties with eating and drinking when they are unwell. This can lead to being thin or losing weight. We know that people who are thin or losing weight recover more slowly from illness and are more likely to fall. We want to improve the services that we provide to these people and in order to improve services we need to understand what is happening at the moment. This study aims to work with both patients and family members/carers, as well as health care professionals, to understand how nutritional care services are experienced and perceived. We will use the information we collect to improve the services in the future.

If you take part in this research we will want to know how you feel about any nutritional care you may have received and to understand your experiences of nutritional care services.

Why have I been invited?

You have been invited to take part in this study because you are attending the outpatient Falls Clinic at the Older Persons Assessment Unit at Guy's and St Thomas' NHS Foundation Trust.

Do I have to take part?

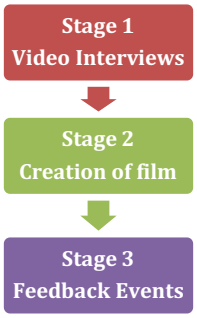
No, it is up to you to decide if you want to take part and if you want your family member/carer to take part with you. Choosing not to be part of the study will not affect the care you are receiving. If you decide to take part, you are still free to withdraw at any time without providing a reason.

Stages of the study

What would taking part involve?

This study has three stages that will be conducted over one year. We are inviting you

to take part in all the stages, however, you have the option to take part in individual stages only. Your family member/friend or carer may also take part in the study with you if they wish.



Stage 1:

In the first stage of the study, you will be interviewed to discuss your perceptions or thoughts about your nutrition and your experiences around any nutrition services provided to you throughout your healthcare journey. The interview will last approximately 1-1.5 hours and will take place at a private space at King's College London, Guy's and St Thomas' Hospital, or your home if preferred. We ask your permission to video and audio record these interviews to powerfully capture your thoughts and feelings and so that your voice will be heard with the healthcare professionals.

Stage 2:

In the second stage of the study, we will identify "touch points" (the crucial moments that shape your overall experience) in your filmed interview. Your filmed interview will be edited by the lead researcher into the clips of your touch points. You will have the chance to view the clips with the lead researcher and agree to which parts of your interview should be added to a 25-30 minute "trigger" film. Your experiences and thoughts will be included alongside those of other participants in the film and this will be shared with other patient participants, carers and healthcare professionals. You will get a chance to view the final film in the next stage.

Based on your consent, the research team will also transcribe the interview and the transcription will be analysed to identify themes for improvement of nutritional management. This pseudo-anonymised information will not include your name or any personal identifiable information and will be discussed during the next stages of the study and used as part of reporting (e.g. PhD thesis, research papers).

The 25-30-minute film will be stored securely on King's College London premises and/or Guy's and St Thomas' NHS Foundation Trust , and used only for the purpose of this research, service improvement and educational purposes within King's College London or Guy's and St Thomas' Hospital NHS Foundation Trust (as per your consent).

Stage 3:

Feedback Event: Meeting other patients and their carers

In this stage you will be invited to attend an approximately 2-hour meeting with the other patient participants and their carers to watch the final 25-30-minute film. At this event you will also have the opportunity to discuss your main priorities for how to improve nutritional services. The results of your discussions will be discussed with healthcare professionals in the next joint feedback events. This event will be held at a room at King's College London or within Guy's and St Thomas' Hospital (details will be provided closer to the event time).

Joint Feedback Event(s): Meeting with healthcare professionals

This next joint feedback event (known as co-design workshops) will be held together with healthcare professionals and possible stakeholders working within the falls prevention services. The purpose of these workshops is for patient participants, carers and healthcare professionals to introduce the film and to discuss the key areas for improvement and work together to better improve nutritional services within the falls prevention services. The 25-30-minute film made and themes from healthcare professional interviews will be used to facilitate these events which will last up to 3 hours. This event will be held at a room at King's College London or within Guy's and St Thomas' Hospital and may be held as more than one event (details will be provided closer to the event time).

Observations and notes will be made by the research team during the individual and joint feedback events, which may be used as part of reporting (e.g. PhD thesis, research papers).

Procedures and supporting Information

Consent procedure(s)

You will be asked to sign a consent form at the different stages if you agree to participate in the study. The first consent form will be for conducting the video and audio recorded interviews (stage 1). Within the consent form, you will be asked whether you would like to be contacted about participation in the following stages of this study (stage 2 and 3 above). If you agree to participate in a future stage of the study, you will be asked to sign a consent form for video release after reviewing the clips chosen (stage 2) and for feedback events attendance (stage 3).

The consent form for video release after viewing the interview clips will describe the use of your filmed interview clips and will provide you with the choice of: (1) using the filmed interview clips or (2) use of narrated quotes within the 25-30 min film.

What are the possible benefits of taking part?

This research study aims to improve future nutritional care provided to people using falls prevention services, however, this study will not provide immediate results for participants taking part.

What are the possible risks of taking part?

We do not anticipate any risk to the participant as a result of the research activity carried out for this study. However, while conducting the interviews and thinking about your healthcare experiences, although we do not anticipate this to be upsetting, if you feel any concern you are free to stop participating at any time. Additional support can be sought from your GP or healthcare team.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the lead researcher who will answer your questions (Massar Dabbous, Massar.Dabbous@kcl.ac.uk). If you would like to speak to somebody independent of the study, you can contact the Patient Advice and Liaison Service (PALS) at Guy's and St Thomas' NHS Foundation Trust (020 7188 8801or pals@gstt.nhs.uk).

In the event that something goes wrong and you are harmed during the research then you may have grounds for legal action for compensation against Guy's and St Thomas' NHS Foundation Trust but you may have to pay your legal costs. Guy's and St Thomas' NHS Foundation Trust maintains adequate insurance to cover any liabilities arising from the study.

Payments

Travel expenses to and from the events will be paid (public transport of up to the cost of a Zone 6 travel card or taxi services). Lunch/snacks and other refreshments will be provided at all the events.

What will happen if I don't want to carry on with the study?

You can choose to withdraw from the study at any time without providing a reason and this will not disadvantage you in any way. You can choose to withdraw your data up until the 25-30-minute film has been made, after which we will use the data collected up to your withdrawal.

What will happen to the results of the research?

The study will be written up as part of a PhD thesis (by Massar Dabbous) and may be published in scientific journals and presented at healthcare conferences. The results may also be used for future educational and service improvement purposes within King's College London and Guy's and St Thomas' NHS Foundation Trust (e.g. shared with other healthcare professionals). You will not be identified in any report and pseudonyms will be used to maintain your confidentiality.

Who is organising and funding this research?

The research is part of a PhD study for the lead researcher Massar Dabbous at the Department of Diabetes and Nutritional Sciences, King's College London. The research is being supervised by Dr. Elizabeth Weekes and Dr. Christine Baldwin.

Has the research been reviewed by an appropriate research ethics committee?

All research in the NHS is looked at by an independent group of people called the Research Ethics Committee to protect your interests. This study has been reviewed and given favourable opinion by the North West-Haydock Research Ethics Committee.

Confidentiality and data protection

Will my information be kept confidential?

Your collected data will be processed in accordance with the General Data Protection Regulation (GDPR). The data collected for the study will be analysed to learn more about perceptions of nutritional management of patient and carers and improve

nutritional services.

Confidentiality will be maintained by the research team who will only have access to identifiable information (e.g. names, contact details) that you provide. As per your consent, only the lead researcher (Massar Dabbous) will access your healthcare record to update your record of participation in the study. Identifiable information, audio and video tapes/DVDs will be kept separately to other data in locked cabinets at King's College London and/or Guy's and St Thomas' NHS Foundation Trust and on a secure password protected database will be maintained by the lead researcher stored on a secure server at King's College London and/or Guy's and St Thomas' NHS Foundation Trust.

Transcription of the recordings will be pseudonymised and will not include your name. The audio tapes of the interview will be destroyed once they have been transcribed and analysed by the research team (by December 2020). The short 25-30-minute film made from the filmed interviews, will include clips from the interviews. No information on your diagnosis, name or location will be on the film. The 25-30-minute film will be stored securely on King's College London and/or Guy's and St Thomas' NHS Foundation Trust secure servers and premises and used only for education purposes and service improvement within King's College London and Guy's and St Thomas' NHS Foundation Trust (as per your consent). Personal identifiable information such as your name or diagnosis will not be shared in the thesis of this project and or publications. You will not be identifiable from any quotes used from your interview.

The lead researcher, Massar Dabbous and chief investigator Dr. Elizabeth Weekes will be responsible for security and access to the data.

Data protection

Guy's and St Thomas' NHS Foundation Trust is the sponsor for this study based in the United Kingdom. We will be using information collected from you in order to undertake this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Guy's and St Thomas' Foundation Trust will keep identifiable information (e.g. names, contact details) about you 1 year after the study has finished (until September 2022). Additionally, any non-identifiable data collected will be secured for a further five years after study completion in keeping with standard research practice of Guy's and St Thomas' NHS Foundation Trust, before being destroyed as confidential waste.

Your rights to access, change or move your information are limited, as we need to manage your information in specific ways in order for the research to be reliable and accurate. If you withdraw from the study, we will keep the information about you that we have already obtained. To safeguard your rights, we will use the minimum personally-identifiable information possible. You can find out more about how we use your information on the link below.
https://www.guysandstthomas.nhs.uk/research/patients/use-of-data.aspx

A code system is used to pseudoanonymise your data and the key is kept confidential and not disclosed to the sponsor, except where the sponsor is also the site. Guy's and St Thomas' NHS Foundation Trust and King's College London will keep your name,

contact details, and other personal identifiers provided (e.g. medical diagnosis) confidential. Guy's and St Thomas' NHS Foundation Trust and King's College London will use this information as needed, to contact you about the research study, and make sure that relevant information about the study is recorded for your care, and to oversee the quality of the study. Certain individuals from Guy's and St Thomas' NHS Foundation Trust and regulatory organisations may look at your research records to check the accuracy of the research study.

What happens if you would like more information about the study?

If you would like to ask any questions or receive more information about the study, please contact us on:

Email: Massar.Dabbous@kcl.ac.uk
Address: King's College London,
Department of Nutritional Sciences
Faculty of Life Sciences and Medicine
Room 4.103 Franklin-Wilkins Building
150 Stamford Street
London SE1 9NH
Phone: 07464393873

Appendix 17: Consent form (HCP interview)

IRAS ID: 260613

Centre Number:

Study Number:

Participant Identification Number for this study:

Name of Researcher: **Massar Dabbous**

STAFF CONSENT FORM (Interview & Feedback Events)

Perceptions of nutritional management by multidisciplinary health professionals and patients and the co-design of intervention strategies for nutritionally vulnerable older people utilising falls prevention services (CONS-F)

Please initial box to indicate consent:

1. I confirm that I have read the information sheet dated 12-Jun-19 (version 2.0) for the above study. I have had the opportunity to consider the information, ask questions and Have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐
3. I agree to take part in an interview lasting up to 1.5 hours. ☐
4. I agree to the audio recording and transcription of my interview and that pseudo-anonymised quotes may be used as part of this research project for educational purposes within King's College London and Guy's and St. Thomas' NHS Foundation Trust. ☐
5. I agree to participate in a feedback event with other healthcare professionals. ☐

6. I agree to participate in a joint feedback event and workshop with other health professionals, stakeholders, service users and carers. ☐

7. I agree to these events being observed by a researcher and anonymised notes be used as part of this research project for educational purposes within King's College London and Guy's and St. Thomas' NHS Foundation Trust. ☐

8. I agree that the research team may use my data for future research and understand that any such use of identifiable data would be reviewed and approved by a research ethics committee. In this project data used will be anonymised. ☐

9. I understand that relevant data collected during the study, may be looked at by individuals from Guy's and St. Thomas' NHS Foundation Trust London or King's College London or from regulatory authorities where it is relevant to my taking part in this research. ☐

10. I would like a copy of any publications from this work. ☐

11. I agree to providing the lead researcher my contact details and may be contacted by the researcher regarding future work on this topic (e.g. feedback events) ☐

Name of Participant	Date	Signature
Name of Person taking consent	Date	Signature

Appendix 18: Consent form (service user interview)

IRAS ID: 260613

Centre Number:

Study Number:

Participant Identification Number for this study:

Name of Researcher: **Massar Dabbous**

CONSENT FORM (Patient Interview)

Perceptions of nutritional management by multidisciplinary health professionals and patients and the co-design of intervention strategies for nutritionally vulnerable older people utilising falls prevention services (CONS-F)

Please check box to indicate consent:

1. I confirm that I have read the information sheet dated 12-Jun-19 (version 2.0) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

3. I agree to take part in an interview lasting up to 1.5 hours. ☐

4. I agree to the audio recording and transcription of my interview and that pseudo-anonymised quotes may be used as part of this research project for educational purposes within King's College London and Guy's and St. Thomas' NHS Foundation Trust. ☐

5. I agree to the video recording of my interview. **Y** ☐ **N** ☐

   a. If yes, I agree to review the film of my interview (at a later date) and I am aware that if I agree to parts of my filmed interview being used, I will be expected to sign a release form for permission for my interview to be used as part of this research project and for educational purposes within King's College London and Guy's and St. Thomas' NHS Foundation Trust London. ☐

6. I give permission for the researcher to access my healthcare records for purposes of this study. Y ☐ N ☐

7. I understand that data collected during the study, may be looked at by individuals from Guy's and St. Thomas' NHS Foundation Trust London or King's College London or from regulatory authorities where it is relevant to my taking part in this research. ☐

8. I agree to providing the lead researcher my contact details and may be contacted by the researcher regarding future work on this topic (e.g. feedback events) ☐

Name of Participant	Date	Signature
Name of Person taking consent (researcher)	Date	Signature

Co-design of nutrition intervention strategies among falls prevention services **(CONS-F)**

HCP Interviews- Topic Guide

Introduction: Thank you for your participation in this study.

Refresh aims of study and interview

ID number and consent

I want to begin by refreshing the aims of this study: The study aims to identify and understand both healthcare professionals' (HCPs) perceptions of nutritional care services and the nutritional management of older adult patients in an outpatient falls clinic and associated falls community services (e.g. strength and balance classes).

As part of our approach we are also interviewing patients' and their carers to identify their perceptions of the nutritional service and care provided throughout their healthcare experience. A joint feedback and co-design workshops will be held to talk about these services and work together to design possible intervention strategies for improvements.

To help with the management of nutrition among the older adults and at the prevention of malnutrition within the healthcare services, I am interested to know your perceptions of nutrition care which we are defining as recognizing, assessing and/or providing nutritional management, as well as your experiences (whether positive or negative) within your practice and any barriers and facilitators relating to the provision of nutritional care.

I want to confirm that you don't mind me recording this interview. The recording will be transcribed and deleted after analysis.

Intro:

1. **Firstly, could you tell me about your profession and role at the falls clinic and/or any other falls services?**

A. Personal perceptions and experience

2. **Can you describe your perception of nutritional care in the older adult patients?**
   - Probes: (Define nutritional care for staff): *any overall screening, assessment or advice performed to evaluate nutritional status.*
   - Thoughts on the role of nutrition in this population and its importance
   - How do you think a poor nutritional status effects this population and their health outcomes (e.g. falls risk)?
   - What does nutritional care mean to you?

3. **In your opinion who do you think is responsible in providing nutritional care within the healthcare organization?**
   - Probes: Overall? And in your team?
   - Do you think you have a role in the identification and management of malnutrition?

4. **I would like to now move on to discussing your experience. Can you tell me about your experience of nutritional care in your practice?**
   - Probes: Activities to support nutritional care of patients
   - Is nutritional assessment or intervention a routine procedure during consultation? (for each profession)
   - Do you advise patients on improving their nutritional status? What advice do you provide?
   - Influencers: When and why do you choose to measure weight, assess nutrition or provide advice? Is there a benchmark?
   - What are the techniques used for identifying/treating malnourished patients?
   - When do you choose to refer to a dietitian?
   - The assessment form

5. **Can you describe in your experience, patients' perceptions of nutritional care?**
   - Probes: (Patients view in your opinion) Do patients ask you for advice related to food and nutrition?
   - Are patients aware of their nutritional status (e.g. if 'thin' or losing weight)?
   - Can you recall a patient who asked you for nutrition advice? What did they ask? How did you handle this?
   - Can you recall a patient receiving a nutrition service (e.g. general advice or dietitian), how satisfied do you think they are?
   - What do you think are the major problems patients have with nutrition?
   - Do you feel there is a need for culturally tailored nutritional care?

B. Barriers/Facilitators/Knowledge

6. **In your opinion what challenges do you find in identifying patients at nutritional risk? (link back to Q. 4)**
   - Probes: Do you have access to nutrition guidelines?

- What sources of information do you use for guidance?
- Time? Knowledge? Awareness? Do you feel training is needed?
- What do you feel your needs are or the clinic's needs are?

7. In your opinion what challenges do you find in <u>providing</u> nutritional care? (link back to Q. 4)

- Probes: Do you have time to provide nutritional care?
- Have you received nutrition-related training? Do you know the interventions for malnourished patients?
- Are there any specific protocols in place?
- Are there any written resources or access to online resources?
-

8. Similar to the questions above, can you tell me what supports you to <u>identify</u> and <u>provide</u> nutritional care?

- Probes: (Link back to Q3) Based on your experiences what activities work well

C. <u>Best and worst bits, and recommendations</u>

9. Can you tell me what was the best part from your experience, if any, in providing nutritional care in this population and supporting their nutritional status? How about the worst part?

a. Probes: (link back to barriers mentioned and experience)

10. What strategies would motivate you in providing nutritional care in practice and improve nutrition risk in this population?

- Are you confident about your nutritional knowledge? Would you like to receive more information on nutrition among the older population?
- In your opinion, what would help you in the identification and provision of nutritional care to patients?
- Based on your first-hand experiences with this population what kind of strategies do you think may help in improving nutritional risk in this population <u>if you were looking to re-design the nutritional service provision in this clinic? Where would you begin? Any targets? Any changes?</u>
-

Is there anything else you would like to add?

Thank you.

Patient Interview Topic Guide

Introduction: Thank you for your participation in this study.

Refresh aims of study and interview

ID number and consent

I want to begin by refreshing the aims of this study: The study aims to identify and understand your thoughts and crucial moments you experienced around a nutritional service or care provided throughout your healthcare experience. As part of the approach we are using we will also involve healthcare professionals in joint feedback workshops to talk about these services and work together to find strategies for improvement based on these crucial moments you describe.

We know it is important to eat well and stay healthy as we age and especially after having a fall. Some people have difficulty eating and drinking which can lead to being thin and losing weight. To help improve these services involved in your nutritional care (which is care surrounding your food intake, meals, and/or eating habits and health). I want to understand what is happening at the moment. I want to know your thoughts around how you feel about what you eat and your body in terms of your nutrition.

I would also like to know your experiences (whether they are good or bad) during any clinic appointment (whether in hospital or outpatient) relating to nutritional care and if you have received any advice or if any professional (doctor, nurse, dietitian) has discussed your food intake and how you felt about these services.

I want to confirm that you don't mind me recording this interview. The recording will be transcribed and deleted after analysis.

Intro:

1. **Can you begin by describing what event brought you to the falls clinic?**
   Probes: Recent fall, process that brought you to the falls clinic

2. **Do you have any medical conditions that you are aware of?**
   Probes: What other regular healthcare services do you use?

A. Personal perception of nutrition

3. **Can you tell me about what you eat usually in a day?**
   - What is are your meals like: breakfast/lunch/dinner

- Who does your food shopping at home? Who prepares your meals?

4. **Can you tell me <u>how you feel</u> about how you're eating (food intake), diet and weight (nutrition)?**
    - *Define nutrition for patients: care surrounding your food intake, meals and/or eating habits and health).*
    - Probes: Do you feel healthy? How are you eating? Do you think you eat well? Appetite?
    - How do you feel about your weight? Are your clothes feeling lose? Do you monitor your weight?
    - Do you think your medical/health condition affects what you eat?

5. **Over the past few years or months, can you tell me any changes (if any) that you have made to what you're eating? (Link back to Q3, depending on answer)**
    - Probes: Are you eating more or less,
    - meal preparation, meals on wheels, strategies
    - and who advised you to make the changes, and why?

6. **Can you describe your thoughts about <u>talking</u> about diet, meals, weight (nutrition) within your healthcare service?**
    - Probes: Do you talk about what you are eating to any healthcare professional? Is it something you think about discussing when seeing a healthcare professional?
    - Do <u>you</u> discuss your nutrition status, meals and food intake? Appetite?
    - If yes, what do you discuss? What influenced talking about nutrition or not?
    - Do you ask for referral to a dietitian? If yes, when and describe.
    - Who would you feel comfortable asking? Who do you think knows about nutrition, where would you go for advice?

<u>B. Perception & experience of nutrition services</u>

Now I want to move on and talk about your experiences during a healthcare visit. Cam you remember a time when you were at a healthcare setting (for example a clinic or hospital)…

7. **What kind of support have you received in relation to nutrition from a dietitian and/or healthcare professional (e.g. your food, diet, weight etc.)?**
    - Probes: For example, did anyone ask you about what you eat? Did anyone take your weight…
    - Discussion around what you eat or weight? Asked or took weight? Have you received information related to improving your food intake, improving your weight?
    - If yes, can you elaborate (where, when, reason, what was provided)?
    - (Linking to answer) With a dietitian or another healthcare professional?
    - How often have you been referred to a dietitian? How often have you seen a dietitian?
    - How often do staff provide you with nutrition advice?

8. **Thinking back to the time you had support received, what did you think of the nutrition service that you were provided during a consultation? (refer back to Q. 6)**
    - Probes: Thinking about the advice you discussed… Can you describe the advice provided? What kind of information have you received? Was it clear/helpful? What did you think about it?
    - Did it work for you in improving your diet?
    - If no advice, did you want advice? Did you bring up nutrition?
    - What did they say?

9. **Again thinking back to the times you mentioned, do you feel staff have supported you/accompanied you regarding your nutritional health? Or do you feel you have you done it very much on your own?**
    - Probes: Followed up? How often do staff provide you with nutrition advice? One time? responded to your suggestions?

- What else would you have liked them to do?
- On your own: where else to you get nutrition information from, research/read on your own?

C. Best and worst bits, and recommendations

10. **Does any specific issue stand out as the best part of nutritional care? How about the worst part of nutritional care?**
    - Probes: (link back to support provided)

11. **Based on your thoughts and experiences around nutrition, what kind of advice would you suggest to improve nutrition services?**
    - Probes: Think about the physical environment, process, staff attitude behaviour, what advice for improvement do you have?
    - Information during waiting times, guidelines, contact information, referrals, leaflets…
    - What information or support would you have liked to receive regarding your diet/nutrition? Examples (Link back to above)
    - Where in your healthcare journey or service are the crucial points to evaluate nutrition in relation to your health? Where/when would like to have nutrition evaluated?

Is there anything else you would like to add?

Thank you.

Appendix 20: Patient & Public Involvement

The following is a summary of the patient and public involvement (PPI) activities undertaken in the preparation of this study.

1. A patient service user and participant involved in previous research helped with the study design in the following ways: feedback on the research topic of interest, recommendations for video filming, recommendations for recruitment, and ethical considerations. Discussion and pilot testing of the research information, (topic guides, participant information sheets, consent forms) were carried out, which aided in refining the study documents. The service user was also invited to be a facilitator for the feedback events if interested. A few of the adjustments highlighted by the PPI service user are highlighted below:

   For example, as part of the EBCD process, there were several stages of consent (interviews, video release, feedback events), thus it was recommended by the PPI to keep these as separate forms and spread them out at each stage to avoid an overwhelming saturation of information at one time, which may discourage participation.

   Language and the appropriate terminology to be used was key to consider within the study documents for the target population. Questions and phrases within the service user topic guide were adjusted, such as not specifying 'thin or fat' which may be sensitive and stigmatizing among the population. Additionally, language and terminology used to address the concept of 'nutrition' were adjusted into more familiar, lay terms such as: 'eat', 'food', 'appetite', 'how are you eating?' and 'do you monitor your weight?'

A recommendation for optimising recruitment among older adults was to highlight the benefit of the research study outcomes and describe how the participants will be 'involved' in the design process for nutritional intervention strategies (co-design).

2. A meeting with the local AGE UK branch coordinator was set up, who aided in facilitating discussions with two AGE UK service users. Piloting of the full interview was performed with the two service users which aided in practicing the conducting the video interviews, reviewing the topic guide questions and recruitment approaches. Notes were taken throughout the meetings and key adjustments made as a result of the piloting activities are highlighted below:

   In addition to adjusting the terminology as highlighted above, a few questions within the topic guide were found to be too long, highlight different concepts, or required a transition question, to avoid confusing answers. For example, question 3 within the first version of the topic guide asked *'Can you tell me how you feel about how you're eating (food intake), diet and weight (nutrition)?'* This was split into two questions, first beginning with a preface of *'Can you tell me about what you eat usually in a day?'* followed by *'Can you tell me how you feel about how you're eating (food intake), diet and weight (nutrition)?'* which connected to the previous question. Additional probing questions were also highlighted such as: *who does your shopping?', meal preparation? Cooking?* As these were brought up and referenced greatly when relating discussing to their food, eating, and nutrition by the service users piloted.

3. Piloting of the HCP interview with a GSTT physiotherapist with experience in falls prevention services was performed aimed at familiarisation with the interview process and refinement of the topic guide questions. A key aspect

within this pilot interview process was the need for me to probe HCPs to address and elaborate on the target questions.

4. The study was presented at the Older Persons Unit multi-disciplinary research meeting at St Thomas Hospital for academic, clinical and practical peer review. This study had an overall positive response from the teams to progress forward and implement. One key comment raised during this meeting which helped inform chapter 5 of this PhD thesis was to know if there were other falls services within UK which have dietetic support. Thus, in parallel to this study, it was decided to conduct a national survey of nutritional care practices within falls services (chapter 5).

5. The nature of the EBCD approach requires active involvement of all participants in the conduct of the study. The service user/carer input on the 'touch points' to be used in the trigger film aimed to help capture the important issues of these service-users that should be discussed for improvement strategies. Additionally, joint workshops involved participants in the design of improvement strategies. Findings are aimed to be fed back to participants at the end of the study.

6. As part of the EBCD process, I originally aimed to recruit volunteer service users (1-2) as patient facilitators for the patient feedback and joint co-design workshops. As patients may feel nervous in participating during group discussion, this aimed to provide a supportive environment for the patient participants to contribute to the group discussions. However, this did not proceed forward in this thesis since the feedback events did not take place due to COVID-19.

Appendix 21: Example of interview transcript (service user) with codes

(Recorder 1: Begin Transcript: 0:18)

MD: Thank you for taking part in the study with me.

I'm just going to start by asking you what brought you to the falls clinic last week or a couple weeks ago?

P10: It was a bit of a misunderstanding really, because I had asked to see a doctor because I do fall asleep quite normally, I can actually fall asleep standing up and I had a fall a couple of months ago and it was quite serious and my son was quite worried that I would kept happening there's something called [XXX], something like that and they thought I might have that, that's why I asked, but it was a complete misunderstanding they though it was just falls.

MD: And what was your most recent fall that you were telling me about?

P10: It was the one where I fell asleep when at the computer, it was in October, and I fell asleep about 1:30 in the morning very inconvenient and I literally just fell asleep at my computer fell off my chair and fractured my femur, left femur

MD: Do you have any other medical conditions that you are aware of?

P10: Well I've got [XXX], [XXX], so they are quite serious if you have falls.

MD: Do you see any health specialist on a regular basis?

P10: Not really, only the rheumatologist

MD: For arthritis?

P10: the bones

MD: Yes okay, can you now tell me what you usually eat in a day?

P10: I have to tell you, I'm a very bad eater…(laughing)…usually toast or cereal for breakfast, ill have a sandwich or, which is white bread, my son tells me off, but its white bread and its usually chicken or ham something like that and I usually have a cup of soup with it, and for dinner I usually have one of the pre-made meals that you can just throw in the microwave , I don't eat a lot of vegetables and I can't eat a lot of fruit because I've got a hiatus hernia which the acid just you know doesn't work properly…so yea apart from that I don't really eat a lot, as I got older I find that I don't have the appetite for a big meal…that's about it really…not very exciting…

MD: Do you do your own cooking and shopping?

P10: I have done in the past, until I've had these accidents recently, I have don't quite a lot of cooking, I used to cook for the old people across the road, but they just a little bit too fussy..

MD: And now do you do your shopping or do your relatives help you?

P10: I do do my own shopping normally, at the moment I cant go out…

MD: So overall how do you feel about your wellbeing and what you are eating, so you are saying you don't have an appetite so much how are you feeling?

P10: Well I know that it's wrong and that I don't eat vegetables and I just don't enjoy eating a lot of vegetable, if they are there I'll eat them, like if I go out for dinner then I'll eat some vegetables but to buy them and cook them, I don't find them very appetizing but if they are already there, probably I've just been really lazy, I think that as you get older do you get very lazy with cooking is concerned.

MD: Do you feel that you are healthy? Or how do you feel overall your wellbeing?

P10: I do feel healthy, I don't feel bad, I just feel guilty that I don't eat as other people seem to eat

MD: In your opinion, why do you think you don't eat so much, or what causes you ?

P10: I think a lot of it is that I don't have the appetite that I used to, I used to have a big appetite, now for the past year or so I haven't had much of an appetite, I did have to go to …oh I can't remember the name of the person, he had to do with your stomach inside and things…and he said that I should eat more sensibly , but I just couldn't be bothered, he said to me 'why don't you eat as well as you should be', and I said 'basically I can't be bothered' , which is very naughty I know.

MD: Has anything changed over the past year, that maybe you felt that effect why you don't have an appetite?

P10: No I don't I cant pin point anything, I think it is just a phase that you gradually don't eat as much as you used to, I don't know , my friends do tell me off, but they are not as old as me, there's about usually there's about 10 years difference , most of my friends are 10 years younger than me, so they're eating habits I suppose are probably a lot better than mine and they can't understand why I haven't got such a big appetite as I used to and I think that comes with age , like I said before.

MD: And do you feel, how do your clothes feel, do you feel like your weight has changed?

P10: Yes, yes my weight recently, over the last 2 or 3 months because when I was in hospital I thought the food was disgusting and all I could eat was soup so I just had the soup and the dessert and I did lose a lot of weight the first time I was in hospital, after the accident, and the second time I was in the hospital quite recently, a friend of mine was bringing food in for me, I didn't eat the soup this time, but yea it was pretty awful .

MD: And, in your opinion, what does nutrition and eating mean to you? So if you were to define it to me?

P10: It should, I mean I know it should mean a lot to me, and my son is constantly telling me off, and I know that I should eat better, but somehow, I never get around

to it. It is important, I know it is important, I know it's important, but it just never comes across to me that well, I'm awful I'm sorry I'm not helping you very much

MD: No, I just want to know your opinion, there is no right or wrong…

P10: But no I agree it is quite important but somehow it never happens to me…

MD: And do you feel like how you're feeling your health conditions affect what you are eating or the other way what you are eating affects your health?

P10: Sorry…?

MD: Do you think that your medical conditions affect what you're eating? Any relations?

P10: I don't know, sometimes I wonder if the tablets have something to do with it, but I just personally think that it is just age, I hate to admit that I am old, but I am.

MD: Over the past few months, can you tell me maybe if you've made any changes in what you are eating?

P10: Changes to my appetite? I can't pin point anything it has just happened, yea it has just happened I don't eat what used to and I don't eat as much as I used to.

MD: And how do you feel about I'm going to move on and ask you how you feel about talking about what you are eating and your weight, so do you ever talk about it when you see a doctor or nurse?

P10: Talk about it to friends?

MD: To medical professions whenever you are in the hospital or clinic or anywhere do you ever bring it up?

P10: I haven't been anywhere…

MD: When you go to the clinic or when you were in hospital do you talk about what you are eating?

P10: No

MD: How do you feel is it something you want to talk about and discuss?

P10: I know I should talk about it but somehow it never happens, there was when I went to see the guy about my stomach, he said that maybe I should go and see a nutritionist but I said no , I didn't want to but I should have done…

MD: is there a reason that you didn't want to maybe? (REPEAT)

P10: I think its because I don't want to admit that Im so bad, you are lucky that im admitting it here to you…(laughing)

MD: Yes admitting to me (laughing) on the camera…

Yes but for example how do you feel about it, is it just something you don't enjoy talking about?

P10: I don't mind talking about it, now that I am, I haven't really sat down and said this is why I do this and perhaps this and perhaps that, but maybe I should, but then I would have to admit that I am lazy and that I don't want to cook, so yea it's a bit of a difficult situation…

(Pause: 12:32)

(Start again: 14:25)

MD: So, I'm going to ask you now a bit if you could remember if doctors or other health professions ask you about related to your food and what you are eating, like the gastro doctor, what kind of things do they ask you about related to eating or nutrition?

P10: Eating wise?

MD: Eating wise, appetite wise, weight wise…

P10: They really didn't go into much detail to be quite honest, they just asked me how I felt, obviously at that time I felt quite grotty, but appetite wise they really didn't go into much, I did tell them that I thought the food was disgusting but I don't think that went down very well…no they didn't really ask me anything about my appetite or anything like that…

MD: Have you been weighed recently (repeat)

P10: Yea I got weighed a couple of days before they let me go home and I was, do you want to know, I don't mind

MD: I want to know how you felt about your weight

P10: To be honest, most of my life I have been on a diet and for the first time of my life I could eat what I want and not put on weight which is wonderful, so I've always wanted to be around 8 stone and I've got there, I am 8 stone 5 and im quite happy about it

MD: and the last time you were weighed, you were much more than that?

P10: I gave up smoking about 9 years ago and I piled on the weight, I went up to 11 and a half stone, I was nearly [XXX} and eventually it all started to come off, but yea I'm quite pleased with the weight I am, I don't really want to go any less, I don't think that would be very healthy, I'm quite happy with how I am

MD: and has anyone throughout your past few years, have you talked to anyone to give you advice on what to eat, diet?

P10: Not really, not a healthy professional no? Somebody from one of these diet clinic, I cant remember what they are called now, like the weight loss things and programs where you pay so much to go and listen to someone talking about losing

weight every week and you sit there green with envy but no nobody actually professional as such

MD: and now has any professional talked to you about eating better?

P10: No and I think that is why I have avoided it.

MD: so now we are kind of thinking if we want to improve and to get people to talk about nutrition and improve services, what do you think in your opinion would you want advice, and how would you want it as well?

P10: I think it should obviously come through the GP surgery, any advice and for normal people who are not ill or anything, I think it should come through the doctor's surgery, yea I would welcome advice if I needed it ...

MD: and what kind of information would you like?

P10: Obviously, how to eat properly which I don't do and advice on really what it's doing for you if somebody says 'you should eat more meat', then they should say why you should eat more meat or less chicken or more greens, I think more information should be given as to how good the things are for you or how bad they are, I don't think there is any real information about that, and taking into consideration age as well, because somebody who is 30 years younger than me would obviously eat differently and would need less nutrition I suppose or I suppose as you get older you need more good things which I am not.

MD: Can you remember for you what changed for you from you were younger to now as you got older?

P10: No it seems a gradual thing, I used to eat quite normally when I was a family with the children and obviously I was very keen for them to eat healthily and I did used to do a lot of cooking when I was married with the younger children, but you know I think when my marriage broke up it was just me cooking for and not cooking very well and not even cooking, so yea it was difficult…

MD: Also are there certain ways that you would like information to you as well…are you a type of person who likes to talk to someone and read things on their own?

P10: Yea to talk to somebody would be better I think it would come across easier, reading about it you 'oh yea that's a good idea' but if somebody actually sat and discussed it with you, I think that would be better …

MD: What other kinds of activities do you do in general?

P10: Well I used to go to a gym, I used to do weight training when I was younger but that doesn't happen now, I wish I could afford go to a gym a real, nice gym not just a council gym but that's not going to happen, yea I go out and I walk, I don't take the bus too much, but obviously at the moment that's not happening, I don't actually go to activity groups, a couple of my friends go to exercise and that sort of thing but I think I'm too lazy

MD: I'm only asking to see in your day to day activities where nutrition could fit in, do you see …

P10: my activities?

MD: Yea where do you think nutrition would fit in in terms of advice or activities

P10: I don't quite understand that…

MD: I'm just asking in terms of your activities where can nutrition fit in? For example …

P10: …I don't know to be honest sorry…(pause)…no I mean, I'm at home quite a lot I do go out shopping and stuff like that and I do go out sometimes to lunch, sometimes afternoon tea and I do go out to dinner quite often, so…nutrition how would that fit in, I honestly don't know , sorry…

MD: No its fine, it's just your thoughts…when you go out to eat do you feel like you eat well when you are out?

P10: Yes, reasonably, I went out on Saturday the first time since I had the accident, so it was quite wonderful to be out, out of my prison…and I had to start with, I had poached salmon with beetroot, which was quite a nice combination and I had chicken breast which was normal and I had a cheesecake so I suppose nutrition-wise it was quite good certainly the salmon and possibly the chicken but I don't think the dessert was very nutritional (laughing)…

MD: What would nutrition mean to you exactly?

P10: It means good things, it should be, but nutrition is what you eat and how good it is for you I don't think it would be for bad, I think it is definitely how good the thing are for you and what they do for you, that sort of thing

MD: Can you tell me a bit more after the accident and how you are feeling with you mobility how it affects your appetite is?

P10: My mobility?

MD: yea or just after the accident does that affect your appetite or your ability to make…

P10: Yes yea I think it has, the fact that I am not as mobile as I used to be is definitely taken its toll because its making me lazy, because I can't do things and I just give up but, hopefully once I can get upstairs I got another 7 week so it is quite daunting, yea that should be it…

MD: Is there anything else that you would like to tell me about that I didn't ask about?

P10: I mean I'm not stupid I do know basically what's good for you and what's bad for you, and I think sometimes a little bit of bad doesn't hurt, that is what I tell myself anyway no I don't think so…

MD: So overall its mainly you don't have an appetite very much and you don't cook very much on you won?

P10: yea …

MD: is there anything that can help with that? if it was something we were to do in your opinion

P10: No not unless we had a chef every day, that would be nice, no I think it's a question of getting my act together really, and I think cause the last couple of months I haven't had the appetite that I used to have particularly since I've had the accident, I just get to the point where I fancy something and I start eating it, and then I just don't want it…and I don't know whether that is good or bad or whether that is normal or maybe I am abnormal , but no I think it's a question once I am up and running again its getting my act together and cooking again, hopefully…

MD: Well thank you so much

(END transcript 29:33)

Appendix 22: Sample of Coding Process (service user)

Theme	Category (codes)	Factors (secondary codes) included and definitions	Example Quote
(1) Changes with age **Definition:** Attributes to the changes of patients experience that affects their eating habits and how they eating habits have changed due to the ageing process	**a) Eating less is part of ageing** ***Subcategory: Set in our ways***	**Includes:** I eat less as I got older/ I don't eat like I used to / my appetite is not like before / eating less is considered a normal part of ageing ***Subcategory***: Hard to change at this age, we are used to it	***P10****: 'No I don't I can't pin point anything, I think it is just a phase that you gradually don't eat as much as you used to, I don't know , my friends do tell me off, but they are not as old as me, there's about usually there's about 10 years difference , most of my friends are 10 years younger than me, so they're eating habits I suppose are probably a lot better than mine and they can't understand why I haven't got such a big appetite as I used to and I think that comes with age , like I said before.'* **P13**: '*To continue, because it is hard at this age to change elderly people because we are set to our pattern, so the only thing is to advise us to encourage us to eat sensibly and when to cook it, how to cook it, that type of thing, like now I won't change my way of eating, not because I don't want to, because I don't see the reason at my age now…'*

	b) Struggles effecting eating habits	**Includes:** age related health condition/comorbidity/ don't have the energy as before/tired or pain/diabetes/ effect of health condition/wellbeing on eating & wellbeing **opposite view also mentioned with struggles with new diagnosis to eat healthier or to lose weight…*	***P4**: 'I think I eat quite well, I do feel it is a bit of a struggle sometimes because… I don't know maybe this is something everyone feels no matter what their age or their health…you think 'oh what I am I going to have for supper'…sometimes the effort involved in planning, shopping, cooking, cleaning up, seems more than I can manage on a bad day…my health, my sense of wellbeing fluctuates quite a lot, like I guess a lot of people with chronic issues and long-term medication use, and on bad days you really don't want to be bothered…'* ***P8**: "No I don't know, I don't know why…when you are younger you've got more energy to stand cooking, when you are older you're not, because when I was young sometimes I get pain in my neck when I'm leaning washing up…"*
	c) No problems=nutrition has not changed (check if combine with category changes with age(a))	**Includes**: Positive aspect of nutrition and ageing No link of nutrition and illness	***P6**: "No, in terms of my diet nutrition and intake if you like, there's not really been any change at all, I don't , the thing is I go out everyday, despite the fact that I got a rather nasty injury to my back, I still manage to get*

		(*Overall Mixed view on health and nutrition perceptions to discuss → those see a problem versus not)*	*around, I still manage to walk as well as I can, I still manage to do exercises…is suppose if you were bedbound or something, then you are not using any energy so your intake would probably go down, but my intake is the same as it was 40 years ago".*
	d) Historical situation when younger	**Includes**: Wartime /types of food varied when younger versus now	**P7**: "*When I was a child we had a lot of things like puddings, meat puddings and potatoes, everything was very very filling and cheap because that was situation, we couldn't really afford to do much else. That's how it went on really I suppose, right up until I was in my late 20s, 30ish, when I suddenly realized 'oh we are not supposed to be doing all this', I joined a diet group and I lost a good amount of weight with them actually , it was really good, and I thought, 'oh okay , this is good, I'm going to stick to this'…"*
	e) Social situation (check if combine with independence)	**Includes:** Living alone /family	***P11**: "oh I think so, I think everyone does you know, like I said we go to this club and we talk about our health and all different things and that, and I'll say what did you have for dinner last night, we're in the same boat, most of the ladies are widows like myself, when you are cooking just for*

			yourself, like I say I got [XXX] she's only a minute around the corner from me and I go there quite a bit especially weekends and that and she takes me out for a surprise meals and that, yea so , she's very good , very good, I try and help her, if I go shopping I take my trolley, and I say do you want me to get you anything and if she wants anything I will get it and she is the same…"
(2) Perception of nutrition for health **Definition**: How participants define nutrition and its importance for their wellbeing → divided into two categories (a) those who see the importance of nutrition and wellbeing and (b) those who eat just to survive	**a) Importance of eating well for the ageing process**	**Includes:** Beliefs and knowledge on the importance of nutrition and wellbeing / being sensible / monitoring weight or not (*Overall Mixed view on health and nutrition perceptions to discuss → those see a problem versus not)*	**P5**:*"Well I think not so much the weight, cause I don't really mind the weight so much cause I think that's exercise that will fat my stomach and everything, but you know as I you read up on things you realize as you get older there's more chance for you to get dementia and stuff like that and diet is supposed to help with anything like that, and I think that's where I'm a bit more conscious about you know when you're younger you don't think about it and it doesn't seem to matter but as you get older it does…"* ***P7**: "…I think it's really important, I think it is important for everybody to eat healthily and it doesn't matter if you are under weight or overweight, it's still important to eat healthy food*

			for everybody. It's just something that as you get older, I think you need to be more careful because obviously you have more health problems as you get older, unfortunately so it's really even more important not to gain too much weight because your body can't cope like it used to …"
	b) "to get by"	**Includes:** Nutrition's role is to survive/ stay alive / don't equate nutrition with health outcomes / not conscious or think about what they are eating /no need to change	**P14**: *"it's just getting I mean you used to hear, you used to, when I was working you were used to certain times for your meals but now I'm retired and I just have it when I am ready I suppose or when they cook it, I don't rush them, I just…no I don't keep to a certain time for lunch or whatever, I just get it when I get it…you know …"* ***P8***: *"Well you have to eat to stay alive, if you don't eat it's like drinking isn't it."*
(3) Independence or lack of	**a) Reliance on assistance from carers/relatives**	**Includes**: the need for help from carers or relatives /assistance with shopping/cooking / trying to remain independent	***P13*****:** *'Well it is part of life, it is important, it is important, when somebody cook[s] for you it is different than when you cook for yourself definitely'*

(4) Doing it on your own **Definition**: Aspect that participants look up resources themselves, or get their nutrition information from own experience or knowledge	**Theme=category**	**Includes**: own readings/ picking it up along the way /knowledge of nutrition from experience /childhood	***P9****: "Well I just think I just pick it up like everybody else, I mean you know I mean I've always been conscience of what's good food and not good food, and what to eat and what not to eat, which doesn't mean to say that I don't eat what I shouldn't eat, I have chocolate and things like everybody else (laughing), but I mean I do know what's good and bad for you…"*
(5) Responsibility to discuss nutrition **Definition**: Expectations who is responsible to bring up nutrition HCP or patient based on thoughts & experiences	**a) No-one asks/not brought up** ***Subcategory:*** **an interest to discuss nutrition**	**Includes**: Is nutrition brought up/no time in consultations/ thoughts about wanting to talk about nutrition / who should bring it up? / (mixed on interest to know more about nutrition care (weight, meals)	***P11****: "No, no…to be quite honest I think some of them are so busy it seems trivial for me just to say you know whether I am eating the right food or not, I'm quite happy with what I have , I try and bury it, but yea I know that when I go to the doctor they try and want to know what you are eating, yea I try and be good, you know now and again I might slip up but everyone..."* ***P4****: "I think…I think it would be very useful… because, what you eat has such a big impact on how you live and sort of just ignore it is quite strange, I always feel very conscious, maybe this is just me, that the medical professionals I see I really under pressure and pressed for time and so*

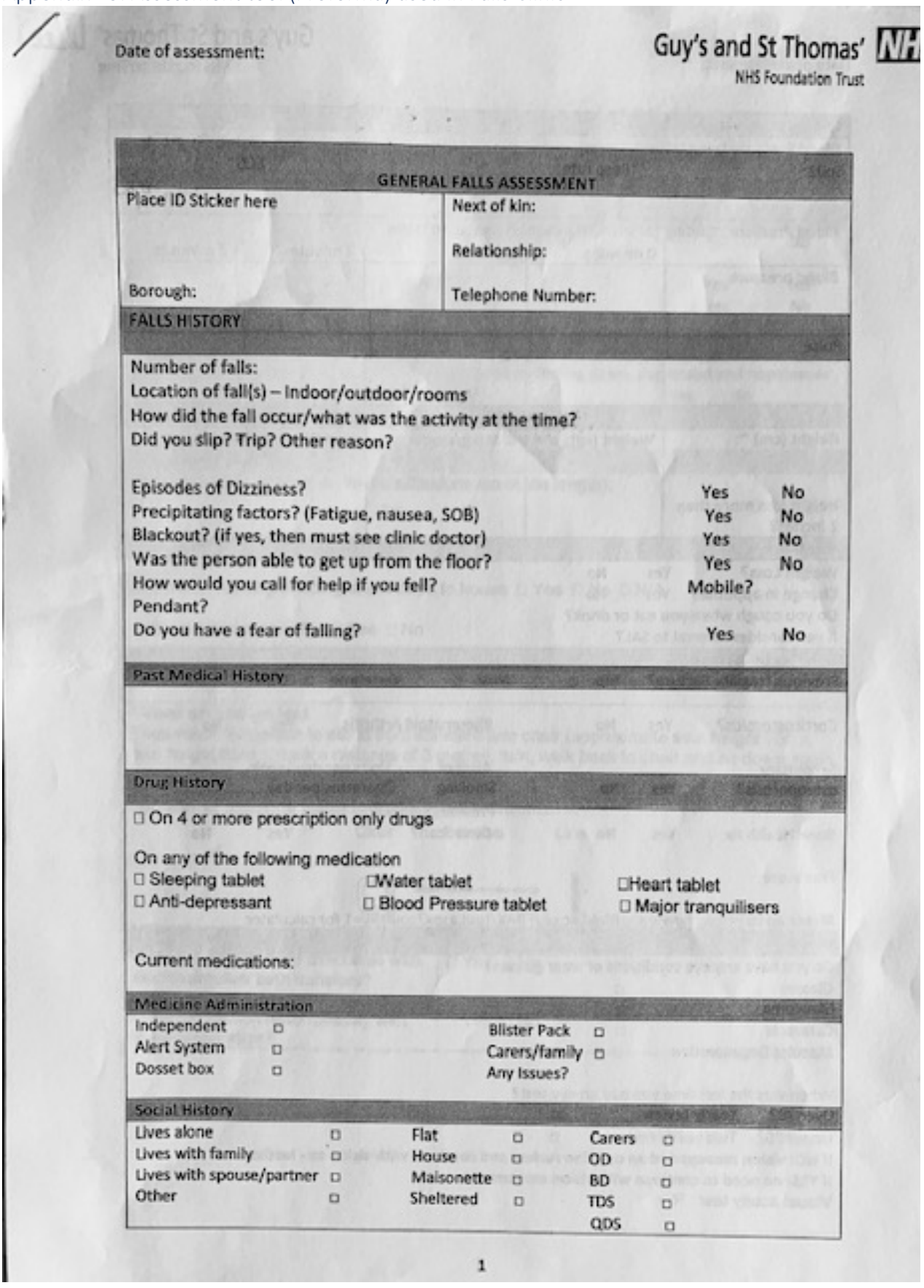
			I'm just managing okay so I don't bring it up." ***P14**: "I don't mind, its nice to know that if I am not losing weight or if am losing weight, then you can probably say this and that or the other, but it doesn't worry me, as long as I don't lose weight, I am alright but …it's the same old thing I suppose you just get used to it, you get into a routine and you know…"*
	b) The need for a 'holistic approach'	**Includes**: idea of bringing specialties together versus separate / feeling like we are in this together	***P4**: 'I've got a few very different health issues and **see different specialists, it's a complete lack of a holistic…an-holistic approach…the whole body…I** see the [XXX] department for my [XXX], and I saw the …go to the [XXX] unit at Guys for those remaining issues, and my GP and how that affects me with the falling and the [XXX] issues I've had…but…I haven't had anyone pull it altogether and look at me as a whole person and how I live and how I eat.'*
	c) Dietitian: Rare nutrition appointments, costly? (check as possible subcategory combination)	**Includes**: experiences and thoughts of dietitians (few), no input	***P14**: "no, no you say all these dietitians all cost money, doesn't it, you have to go out and by all these special …and I can't afford that on my bit of pension…"*

(6) Need for motivation & support **Definition**: Motivation and support is needed and will help improve eating habits. The examples of the support that is needed (where and how) is described in the categories. ***nutrition intervention strategies are described by some participants here***	**a) Motivation & discussions from others**	**Includes**: experiences with motivating advice that was provided by HCPs throughout health journey/ positive feedback of exercise groups / benefits of talking to others experiences the same thing /	***P16**: 'For instant when you are in a group you would get different ideas from them, what they use, because for some people their [XXX] under control, that is what I would love you know, and sometimes people they use different things, and from what they tell you then from that, you can say oh I can try this and I could try that you know …'*
	b) Support for ageing (check to combine with discussions (a))	**Includes:** age specific nutritional support and advice needed by participants/ practical & easy	***C1**: "I don't know I mean its like you have got some facilities you get like monthly subscription booklets and that, maybe at this kind of clinic, maybe for elderly people something can be sent you know to sort of like aid in what they are eating and drink that kind of thing, because as what my mum said sometimes you don't know what to eat or drink …"* ***P8**: "…well it would be interesting to sit down with someone and talk about easy food that you could cook, so instead of me cooking up baked potatoes and cabbage, that I do, not every night I must admit, I used to, I have frozen dinners I get them out now and then, I'm not so keen on them but I do have them."*

	c) Understanding benefits of nutrition for health	**Includes**: discussions around why the food is good for you and the benefits of nutrition on their health /understanding benefits help improve eating habits	***P10****: "Obviously, how to eat properly which I don't do and advice on really what it's doing for you if somebody says 'you should eat more meat', then they should say why you should eat more meat or less chicken or more greens, I think more information should be given as to how good the things are for you or how bad they are, I don't think there is any real information about that, and taking into consideration age as well, because somebody who is 30 years younger than me would obviously eat differently and would need less nutrition I suppose or I suppose as you get older you need more good things which I am not."*
	d) Community & discharge support	**Includes**: support needed when leaving the hospital and within the community when go home or as outpatient	***P4****: " I think there should have been much more emphasis on nutrition when I was discharged from hospital after a [XXX] treatment, because I was going to be on long-term hormone treatment and the medication would have effects on my appetite and on my weight and I was convalescing and I think some general advice on how to eat in that sort of circumstances…"* ***P5****: "Its funny because contact information certainly for the falls*

			clinic is amazing, I mean I got a scan I had this I saw a physio all that sort of thing, so that was very impressive, so maybe if they did something like that for diet as well, and again for the over 60s really because its more important I think for us than younger people, although there are younger people who are getting fatter and fatter, lack of exercise…"

Appendix 23: Assessment tool (Proforma) used in Falls Clinic



Date of assessment:

Guy's and St Thomas' NHS Foundation Trust

GENERAL FALLS ASSESSMENT

Place ID Sticker here	Next of kin:
	Relationship:
Borough:	Telephone Number:

FALLS HISTORY

Number of falls:
Location of fall(s) – Indoor/outdoor/rooms
How did the fall occur/what was the activity at the time?
Did you slip? Trip? Other reason?

Episodes of Dizziness?	Yes	No
Precipitating factors? (Fatigue, nausea, SOB)	Yes	No
Blackout? (if yes, then must see clinic doctor)	Yes	No
Was the person able to get up from the floor?	Yes	No
How would you call for help if you fell?	Mobile?	
Pendant?		
Do you have a fear of falling?	Yes	No

Past Medical History

Drug History

☐ On 4 or more prescription only drugs

On any of the following medication

☐ Sleeping tablet	☐Water tablet	☐Heart tablet
☐ Anti-depressant	☐ Blood Pressure tablet	☐ Major tranquilisers

Current medications:

Medicine Administration

Independent	☐	Blister Pack	☐
Alert System	☐	Carers/family	☐
Dosset box	☐	Any Issues?	

Social History

Lives alone	☐	Flat	☐	Carers	☐
Lives with family	☐	House	☐	OD	☐
Lives with spouse/partner	☐	Maisonette	☐	BD	☐
Other	☐	Sheltered	☐	TDS	☐
				QDS	☐

1

Guy's and St Thomas' NHS
NHS Foundation Trust

Date of assessment:

Clinical observations

Blood Pressure Lying (after 10 mins) BP: Pulse:
Sp02: Resp rate ECG

Blood Pressure standing (or sitting if patient is unable to stand:

	0 minutes	1 minute	2 minutes	3 minutes
Blood pressure				
Pulse				

Height (cm) *:	Weight (kg):	BMI (kg/cm):	Blood Glucose (4-11mmol):
Height loss more than 2 inches?			

Nutrition

Weight Loss? Yes No
Change in appetite? Yes No
Do you cough when you eat or drink?
If yes consider referral to SALT

Bone Health Screen

Previous Fragility Facture? Hip ☐ Wrist ☐ Vertebrae ☐ Other .....

Corticosteroids? Yes No Rheumatoid Arthritis Yes No

Secondary osteoporosis? Yes No Alcohol Units per day/week.....
Smoking Cigarettes per day.....
Previous smoker?

Bone Health Rx Yes No Dexa Scan? Yes No

Frax score:

Please go to https://www.sheffield.ac.uk/FRAX/tool.aspx?country=1 for calculator

Vision

Do you have any eye conditions or wear glasses?
Glasses ☐
Glaucoma ☐
Cataracts ☐
Macular Degeneration ☐

When was the last time you had an eye test?
Over 70? Yearly review ☐
Under 70? Two yearly review ☐
If NO: vision recommend an optician review and continue with vision ax - leaflet
If YES: no need to continue with vision assessment
Visual acuity test: R = L =

Date of assessment:

Guy's and St Thomas' NHS
NHS Foundation Trust

Continence

Urinary: ☐ Urgency ☐ Nocturia ☐ Stress
Bowels: ☐ Incontinent of faeces ☐ Constipation

Foot Health

Foot problems i.e. corns, bunions, swelling, overgrown toenails	Yes	No
Who looks after your toenails?		
Inappropriate/ poorly fitting/ worn footwear	Yes	No
Referral required to foot health?	Yes	No

Mood

During the last month have you often been bothered by feeling down, depressed and hopeless or having little interest or pleasure in doing things? Yes No

Consider onward referral to the GP for assessment of mood.
Discuss onward referral to befriending service if appropriate.

Function & Equipment

Gait analysis (unsteady on feet/shuffles/uneven stride length):

Poor balance: ☐ Yes ☐ No

Reported difficulty climbing stairs/steps to house: ☐ Yes ☐ No ☐ N/A

Gait aid (please specify): ☐ Yes ☐ No

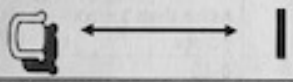
New walking aid required ☐ Yes ☐ No

Timed up and go test

Time taken for person to stand from standard arm chair (approximate seat height 46cm, arm height 65cm), walk a distance of 3 metres, turn, walk back to chair and sit down again using normal walking aid and regular footwear.

Number of seconds taken to perform test:.....

Chair 3 metres Line



Functional ability

Does the person have difficulties with bed/chair/toilet/ bath transfers?	☐ Yes ☐ No
Does the person have difficulty with meal preparation?	☐ Yes ☐ No

3

Date of assessment:

Guy's and St Thomas' NHS
NHS Foundation Trust

Cognition		
Lacks insight into general safety/unconcerned re falls	Yes	No
Difficulty Following instructions and/or confusion	Yes	No
Difficulty with short term memory	Yes	No

6CIT Test	**Score Range**	**Score**
Question		
1. What year is it?	**0-4** Correct – 0 points Incorrect – 4 points	
2. What month is it?	**0-3** Correct- 0 points Incorrect- 3 points	
3. Give the patient and address phrase to remember with 5 components- Eg. **John, Smith, 42, High Street, Bedford.**		
4. About what time is it? (within 1 hour)	**0-3** Correct - 0 points Incorrect - 3 points	
5. Count Backwards from 20-1	**0-4** Correct – 0 points 1 error – 2 points More than 1 error – 4 points	
6. Say the months of the year in reverse	**0-4** Correct – 0 points 1 error – 2 points More than 1 error – 4 points	
7. Repeat address phrase **John, Smith, 42, High Street, Bedford**	**0-10** Correct – 0 points 1 error – 2 points 2 errors – 4 points 3 errors – 6 points 4 errors – 8 points All wrong – 10 points	
Total Score		**/28**

Outcome	
0 - 7= Normal	Referral not necessary at present
8 - 9 = mild cognitive impairment	Probably refer
10 – 28 = significant cognitive impairment	Refer

4

Appendix 24: List of Trainings and activities attended throughout PhD journey

Type	Title	Date	Location
Journal Reviewer			
	Reviewed manuscripts for the following journals: Clinical Nutrition BMC Geriatrics BMJ	2019-2021	-
Teaching and Presenting			
	GTA - Preparing to Teach in Higher Education for GTAs	May/2019	KCL
	Presentation skills	May/2019	KCL
	Public Speaking	May/2019	KCL
	Webinar Speaker: Evidence for Nutritional Intervention in Hip Fracture and Issues for Clinical Practice	Dec/2020	Fragility Fracture Network
Research Methods			
	Health Economic Evaluation: An Overview Cost –effectiveness modelling	March/2021	KCL
	Data management using R Descriptive statistics in R Estimation and Hypothesis Testing in R	March/2021	KCL
	Introduction to Qualitative Research	Feb/2020 Jan/2020	KCL
	Qualitative Data analysis Conducting Focus Groups	Feb/2020	UCL
	Introduction to NVIVO	Dec/2019	SOAS
	Internal FoLSM qualitative interviewing workshop	Jul/2019	KCL
	Qualitative Data collection: Interviewing Qualitative data collection: Ethnography, Observation	Mar/2019	KCL
	Social Network Analysis	Nov/2018	KCL/LISS
	Clinical Research Protocol Development	Oct/2018	KCL
	Introduction to Meta-Analysis	Nov/2018	BRC
	PPI Training session for research involvement	Feb/2018	BRC

	Experienced Based Co-design Work shop	May/2018	Point of Care Foundation
	Introduction to systematic reviewing	10/Nov/2017	BRC
	GCP for non-CTIMPs training session	16/Oct/2017	BRC