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SUMMARY WITH CRITICAL APPRAISAL

Interventions for Malnutrition in Older Adults: A Review of Clinical Effectiveness

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

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Abbreviations

BMI	Body Mass Index
GDS-sf	Geriatric Depression Screening Scale
MMSE	Mini Mental State Examination
MNA	Mini Nutritional Assessment
MNA-sf	Mini Nutritional Assessment (short form)
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

Context and Policy Issues

Malnutrition occurs when an individual does not consume a diet that provides them with an appropriate quantity or balance of nutrients (i.e., deficiency in nutrient intake, over nutrition, or imbalance due to impaired nutrient metabolism).[1] Poor diet quality is associated with a variety of adverse health problems, such as anemia, immune dysfunction, decreased bone health, cardiovascular disease, metabolic syndrome, reduced cognitive function, impaired muscle function, increased risk for injury, poor wound healing, and increased mortality.[2-6] Malnutrition is especially concerning in older adults due to many factors that increase susceptibility, including chronic disease, side effects of medication, loss of appetite resulting from impaired sense of smell and taste, socioeconomic factors, poor cognition, functional decline, and physiological changes that occur as part of the aging process.[7-12] A survey conducted in 2008 by Statistics Canada estimated that up to 34% of Canadians aged 65 or older were at nutritional risk, emphasizing the need to implement malnutrition screening and treatment programs.[13]

A variety of strategies have been developed to help prevent and treat malnutrition. These commonly involve diet, nutrition supplementation, meal delivery programs, and nutrition education or counselling.[12,14,15] While there are a number of interventions available, there is uncertainty around which of these programs should be offered to older adults who are living in the community and have been assessed as at nutritional risk or diagnosed as malnourished.[5]

This report expands upon a previously completed summary of abstracts report.[16] The objective of the current report is to summarize and appraise the evidence regarding the clinical effectiveness of interventions for community-dwelling older adults who are malnourished or at nutritional risk.

Research Question

What is the clinical effectiveness of interventions for community-dwelling older adults who are malnourished or at nutritional risk?

Key Findings

One relevant systematic review with meta-analysis, one partially randomized clinical trial, and one non-randomized study were identified regarding the clinical effectiveness of nutritional interventions for community-dwelling older adults who are malnourished or at nutritional risk. The studied interventions included multidisciplinary nutritional interventions, dietary intensive treatment, medical treatment, and meal delivery service through Meals on Wheels.

Evidence of limited quality from one partially randomized clinical trial suggested that dietary intensive treatment is likely effective for decreasing the cost of primary care physician visits

and the cost of medical specialist visits compared to medical treatment or usual care. There were no statistically significant differences between participants who received multidisciplinary nutritional interventions, meal delivery service through Meals on Wheels, and usual care for quality of life or various health care utilization outcomes. Information on additional clinical outcomes was also identified and summarized; however, most of the included studies lacked sufficient power to detect a significant difference between nutritional intervention and control groups.

Given the limited availability of relevant literature and the methodological limitations of the reviewed studies (e.g., lack of data from randomized controlled trials, the low number of included participants), the effectiveness of nutritional interventions for community-dwelling older adults who are malnourished or at nutritional risk remains uncertain.

Methods

Literature Search Methods

This report makes use of a literature search developed for a previous CADTH report.[16] A limited literature search was conducted on key resources including PubMed, the Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No methodological filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2008 and September 26, 2018.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Adults aged ≥65 years who are living in community and have been assessed as 'at nutritional risk' or diagnosed as 'malnourished'
Intervention	Nutrition intervention programs and services (e.g., congregate dining facilities/ programs, meal delivery programs, provision of oral nutrition supplements, adult day programs with nutrition/meal components, cooking class)
Comparator	Usual care, control
Outcomes	Decreased health care utilization (e.g., hospital admissions, readmissions, hospital length of stay), quality of life
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2008. Primary studies retrieved by the search were excluded if they were captured in one or more included systematic reviews.

Systematic reviews that had inclusion criteria more broad than that of our review were examined in detail to ascertain whether data could be extracted from a relevant sub-set of included studies, rather than excluding the systematic review entirely. If we were unable to identify relevant studies upon detailed investigation the systematic review was excluded.

Critical Appraisal of Individual Studies

The included systematic review was critically appraised by one reviewer using AMSTAR 2,[17] and the included clinical studies were critically appraised using the Downs and Black checklist.[18] Summary scores were not calculated for the included studies; rather, a review of the strengths and limitations of each included study were described.

Summary of Evidence

Quantity of Research Available

A total of 332 citations were identified in the literature search. Following screening of titles and abstracts, 326 citations were excluded and six potentially relevant reports from the electronic search were retrieved for full-text review. Eight potentially relevant publications were retrieved from the grey literature search for full-text review. Of these 14 potentially relevant articles, 11 publications were excluded for various reasons, while three publications met the inclusion criteria and were included in this report. These comprised one systematic review with meta-analysis,[19] one partially randomized clinical trial,[20] and one non-randomized study.[21] Appendix 1 presents the PRISMA[22] flowchart of the study selection.

Additional references of potential interest are provided in Appendix 5.

Summary of Study Characteristics

One relevant systematic review with meta-analysis,[19] one partially randomized clinical trial,[20] and one non-randomized study[21] were identified and included in this review. No relevant health technology assessments were identified. Study characteristics were extracted by one reviewer and are summarized below. Detailed characteristics are available in Appendix 2, Tables 2 and 3.

Study Design

The Rasmussen et al.[19] systematic review conducted a series of systematic literature searches from 2013 to 2017 to identify controlled studies (both randomized and non-randomized) published after January 2007 that met their eligibility criteria. These searches were supplemented by hand searching and expert consultation to identify additional grey literature. The authors identified and reviewed five controlled studies, including two primary studies[23,24] that were relevant under our eligibility criteria in Table 1.

Two relevant clinical studies were identified, including one partially randomized clinical trial,[20] and one non-randomized study.[21] The Endevelt et al. study[20] recruited patients aged 75 or over who were identified as at nutritional risk (as assessed by various biochemical criteria). Recruited participants were randomized to one of two intervention groups (dietary intensive treatment or medical treatment). Participants who agreed to be evaluated but were unwilling to have home visits by a dietitian or who had communication and language difficulties were allocated (in a non-randomized fashion) to a third group who received usual care. The study by Luscombe-Marsh et al.[21] retrospectively analyzed data from a previously

published study[25] to examine the differences in outcomes between poorly nourished older adults (≥69 years of age) who received home-delivered meals from Meals on Wheels and those who did not.

Year of Publication and Country of Origin

The included systematic review[19] was published in 2018 by authors based in Denmark and Sweden. The two relevant primary studies included in the systematic review were conducted in Denmark and published in 2015[23] and 2013.[24]

The included clinical studies were conducted in Israel[20] and Australia[21] and were published in 2011 and 2013, respectively.

Patient Population

The eligibility criteria for the Rasmussen et al.[19] review were studies that included elderly patients (≥65 years of age) who were hospitalized and then discharged back into the community. The primary study patient populations were classified as either being identified as at risk for malnutrition or that their nutritional status was not evaluated. While their inclusion criteria was more broad than our eligibility criteria in Table 1, studies in patient populations that were assessed as at risk for malnutrition and were living in the community at the time of nutritional intervention were considered relevant for our review. The number of participants included in the relevant primary studies was 71 and 152, for a total of 223. Patient populations from relevant studies had mean ages ranging from 72 to 85. No information on the sex distribution or Body Mass Index (BMI) of participants was summarized in the systematic review.

The partially randomized clinical trial[20] recruited older adults (≥75 years of age) who were living in the community and were identified as at nutritional risk based on several biochemical parameters (total serum cholesterol of <160 mg/dL, or a serum albumin level of <3.5 mg/dL, or a total lymphocyte count of <1800) and subsequent screening with the short version of the Mini Nutritional Assessment (MNA-sf). Participants with a diagnosis of cancer or liver disease, clinical depression, cognitive impairment (Folstein Mini Mental State Examination [MMSE] score <23), and inability or unwillingness to sign an informed consent were not eligible for the study. The study recruited a total of 127 participants, including 68 participants that were randomized to receive either dietary intensive treatment or medical treatment, as well as 59 additional participants who agreed to be evaluated but were not included in the randomization process following baseline assessment due to communication and language difficulties or unwillingness to have home visits by a dietitian. The mean age of participants in the study was 84.5 years and the proportion of female participants was 62%. The mean BMI of participants was 27.3 kg/cm^2.

The non-randomized study by Luscombe-Marsh et al.[21] included data from older adults (≥69 years of age) who were living independently and were identified as poorly nourished using the Mini Nutritional Assessment (MNA). The patient population retrospectively analyzed in this study comes from a previously reported trial.[25] A total of 250 participants were included in the study; however, one of the three groups examined in the study was classified as well-nourished, thus not meeting our eligibility criteria. These participants are included in our review, while the remaining two groups that included a total of 108 individuals will be further discussed. The mean age of these participants was 79 years (range = 69 to 99). The proportion of female participants was 73.2%. Mean MNA scores and BMI were 20.5 and 24.6 kg/cm^2, respectively.

Interventions and Comparators

The three included studies[19-21] investigated a variety of nutritional interventions. The systematic review[19] included studies that evaluated the effectiveness of multidisciplinary nutritional interventions, defined as interventions incorporating nutrition as a clearly identified integral component by more than one profession, compared to usual care. Interventions were described based on the professionals involved in their delivery, their duration, and a brief summary of their components. There were two relevant primary studies identified within this review.[23,24] The first primary study[23] evaluated a 12 week nutritional intervention delivered by a liaison team and a registered dietician. This involved three home visits and individualized nutritional therapy based on past medical treatment, the patient's functional abilities and ability to cope with activity of daily living, and a need for change in social services (with oral nutritional support as needed). The control group in this study received usual care, defined as one home visit without any dietary counselling. The second primary study[24] assessed a nutritional intervention delivered by a registered dietitian and a general practitioner over the course of 12 weeks. Similar to the first study, this intervention consisted three home visits, individualized nutritional therapy (with oral nutritional support as needed), and at least one counselling session involving both the dietician and the participant's general practitioner to discuss the treatment. The usual care control group in the second primary study received three home visits without dietary counselling.

The study by Endevelt et al.[20] included three intervention groups: dietary intensive treatment, medical treatment, and standard care. Participants in the dietary intensive treatment group received an individualized treatment strategy managed by the study dietitian over the course of six months. The intensity of the intervention varied according to the severity of malnutrition the individual was experiencing. Some of the key activities included in the plan were a nutritional assessment, the provision of food supplements (if needed), an evaluation of dietary intake, recommendations for improving quantity and quality of consumption, and an adjustment to the recommendations according to the individual's nutritional status after several months and personal requests. This plan could also be provided to an immediate relative or formal caregiver depending on their living situation. Participants in the medical treatment group received treatment from their primary care physician. They were also provided with a booklet on nutrition education for older adults. The standard care group underwent standard geriatric assessment, which at the time of the study did not include dietary assessment or treatment.

The Luscombe-Marsh et al.[21] study retrospectively evaluated various health outcomes and hospitalization data from individuals who received or did not receive home-delivered meals through the Meals on Wheels program, a publically funded home-care service provider. Limited details on the frequency of meal delivery and the types of food offered through the program were available in the publication.

Outcomes

The systematic review[19] categorized outcomes of interest as either critical or important. Critical outcomes were mortality, hospital readmissions, and quality of life, while the important outcomes were nutritional status, drop outs, and adverse events. Data on mortality, hospital readmissions, and quality of life could be extracted from the sub-set of relevant primary studies.[23,24]

The Endevelt et al.[20] study monitored dietary intake of selected nutrients, number of diagnoses and prescribed medications, physical functioning, depression scores, cognitive function, and cost of various health care services as outcomes of interest. Cognitive status was assessed using the Folstein MMSE, a scale with potential scores ranging between 0 and 30 (higher scores indicate better cognitive function.) Depression severity was estimated using the Geriatric Depression Screening Scale (GDS-sf), a questionnaire that consists of 15 questions that can be answered with yes or no. A score greater than 5 indicates depression. Functional status was evaluated using the modified Barthel Index[26] based on basic activities of daily living. Scores range between 0 and 100, where 0 represents total dependence and 100 represents total independence. All three of these questionnaires are validated for use by the Israeli population (the country in which this study took place) and have been used in similar studies.[27]

The Luscombe-Marsh et al.[21] study retrospectively analyzed data on the number of participants who were alive, changed their living situation, experienced weight loss, or were admitted to hospital throughout the six month study period. The authors also investigated the average length of hospital admission and the percentage of hospital stays longer than 14 days.

Our review was most interested in outcomes relating to health care utilization (e.g., hospital admissions, readmissions, hospital length of stay) and quality of life, therefore, these results will be prioritized in our discussion.

Summary of Critical Appraisal

Critical appraisal of the included studies is summarized below and detailed in Appendix 3, Tables 4 and 5.

Systematic Reviews

The strengths and limitations of the included systematic review[19] were assessed using the AMSTAR 2[17] tool. The authors of this systematic review clearly described their objectives, inclusion and exclusion criteria, and methods for article screening and selection. A comprehensive literature search with multiple databases was conducted and the search strategy (key words, names of databases searched, and dates of search) was described in detail. These strengths of reporting increase confidence in the findings and the reproducibility of the systematic review. The review protocol was not published *a priori*, therefore it is unclear if the review methods were established prior to conducting the review or if the eligibility criteria was decided on after discovering relevant literature. Study selection and data extraction were performed individually by multiple authors followed by group discussion of results, decreasing the likelihood for inconsistency in these processes. The authors provided a list of excluded studies and their reasons for exclusion, increasing confidence in the study selection process. Meta-analysis was conducted using appropriate methods for the statistical combination of results and heterogeneity was assessed when appropriate (using I^2 statistics), increasing the credibility of the pooled estimates. However, pooled estimates from the systematic reviews could not be extracted for our report as the pooled data presented in the Forest plots included primary studies that were not relevant under our inclusion criteria. There was no analysis to assess publication bias due to the relatively low number of studies identified; therefore, it is unclear if selective publication of studies has influenced findings. While the systematic review stated that the authors of primary studies disclosed their source of funding, no information on who funded these

studies was summarized in the review. The authors of the systematic review declared they had no conflicts of interest related to this review.

In addition to the strengths and limitation identified as part of our review using AMSTAR 2,[17] the authors of the systematic review[19] assessed the risk of bias in the included primary studies with the Cochrane Collaboration's risk of bias tool. The two included relevant primary studies[23,24] were assessed as being at low risk of bias for selection bias (randomization process and allocation concealment), attrition bias (outcome data was assessed as complete), and reporting bias (there was a small risk for selective reporting). However, the systematic reviews authors assessed the primary studies as being at high risk of bias for performance and detection bias due to the lack of proper blinding for participants, study personnel, and outcome assessors.

Primary Studies

The strengths and limitations of the two included primary studies[23,24] were identified based on the assessment using the Downs and Black Checklist.[18]

The Endevelt et al.[20] partially randomized clinical trial had clearly described objectives, interventions, controls, main outcomes, and included detailed methodology on patient recruitment and assessment of patient eligibility criteria; however, the details of the randomization process were lacking and a smaller number of patients was recruited than what was estimates as needed with their sample size calculations. Another limitation of this study[20] is the strategy used for patient recruitment into the standard care group. This group was formed from patients who had language and communication difficulties or were not willing to undergo the treatment intervention. Although all study participants were screened using the same eligibility criteria, this break in randomization creates a source of bias as these participants may have been inherently different than those randomized to the dietary intensive treatment and medical treatment groups. This risk could have been mitigated by randomizing participants to all three treatment groups. The lack of blinding of outcome assessors in this open-label study could have led to bias in either direction, especially for outcomes that are of a subjective nature (e.g., depression score).

The Luscombe-Marsh et al.[21] non-randomized study provided clear descriptions of the objectives, intervention, controls, and main outcomes. Due to the retrospective nature of the study, it was not possible to randomize participants or to blind participants or those analyzing the data retrieved from the database. Treatment and control groups were overall balanced in the baseline patient characteristics (e.g., sex, BMI, MNA score, comorbid diagnoses); however, a significant differences between groups was reported for age and the number of participants in the Meals on Wheels group (N = 28) was substantially smaller than in the non-Meals on Wheels group (N = 80). It should also be noted that participant compliance with the intervention was difficult to assess.

Both primary studies included participants and care settings that appear to be representative of the population and setting of interest, increasing the generalizability of the findings. However, all participants from both studies were initially screened from two separate "computer databases". It is not clear where these populations were registered from and whether they can be considered truly representative of the real world. A more detailed reporting on where these populations came from would help alleviate uncertainty. The authors of both studies stated that they had no conflicts of interest and their sources of funding are not likely to have influenced the findings.

Summary of Findings

The overall findings of the included literature are summarized below. A detailed summary of the main findings are available in Appendix 4, Tables 6 and 7.

Clinical Effectiveness of Interventions for Community-Dwelling Older Adults who are Malnourished or at Nutritional Risk

Health Care Utilization

Information on the effectiveness of nutritional interventions for health care utilization outcomes was available from one systematic review,[19] one partially randomized clinical trial,[20] and one non-randomized study.[21]

The systematic review[19] included two relevant primary studies[23,24] that compared treatment with multidisciplinary nutritional interventions to usual care. The results of both studies suggested that there were no significant differences ($P > 0.05$) between treatment groups for rates of hospital readmission at follow-up (26 weeks in both studies). Hospital readmission rates ranged between 28% and 53% for the various intervention groups.

The Endevelt et al.[20] partially randomized clinical trial compared the cost of health care utilization across the three intervention groups under study (dietary intensive treatment, medical treatment, and usual care). The dietary intensive treatment group had significantly lower costs of patient visits to primary care physicians and cost of patient visits to medical specialists compared to either comparator group. There were no statistically significant differences for cost of hospital admissions or costs of medications between any of the intervention groups.

The non-randomized study by Luscombe-Marsh et al.[21] examined the association between receiving meal delivery service through Meals on Wheels and hospital admissions. The number of participants admitted to hospital and the number of participants who required a hospital stay greater than 14 days did not significantly differ between the Meals on Wheels group and the non-Meals on Wheels group.

Quality of Life

Information on the effectiveness of nutritional interventions for quality of life was available from one systematic review.[19] One relevant primary study[23] included in the systematic review[19] assessed quality of life in participants treated with either a multidisciplinary nutritional intervention or usual care. There were no statistically significant differences between treatment groups for quality of life at post-treatment (actual values were not reported in the systematic review).

Additional Clinical Outcomes

A number of additional clinical outcomes were reported from one systematic review,[19] one partially randomized clinical trial,[20] and one non-randomized study.[21]

The systematic review noted that the mortality rate of participants did not significantly differ between the multidisciplinary nutritional intervention and usual care groups in either of the included relevant primary studies.[23,24]

The partially randomized clinical trial[20] monitored the number of diagnoses, number of prescribed medications, physical functioning score, depression score, and cognitive function score at six month follow-up. There were significant differences detected for

depression score and cognitive function score, favouring treatment with dietary intensive treatment. The remaining outcomes did not significantly differ between treatment groups.

The study by Luscombe-Marsh et al.[21] reported on the number of individuals who experienced weight loss or suffered from a fall. The Meals on Wheels and non-Meals on Wheels cohorts did not significantly differ for either of these outcomes.

Limitations

A number of limitations were identified in the critical appraisal (Appendix 3, Tables 4 and 5), however, additional limitations exist.

The partially randomized[20] and non-randomized[21] designs used in the identified primary studies are susceptible to a number biases, limiting confidence in their findings. Acknowledging this, the authors of the non-randomized study[21] referred to their findings as "preliminary data", suggesting a need for more robust study designs. It is difficult to be certain of the true effects and magnitude of benefit of these nutritional interventions without data from well-designed randomized controlled trials.

The varying effect that nutritional interventions may have on older adults with risk for malnutrition and who have other comorbidities (e.g., cardiovascular disorders, gastrointestinal disorders, respiratory disorders, cancer, diabetes, osteoporosis, Parkinson's disease, mental health conditions) could not be established based on this review. The non-randomized study[21] reported on the proportion of participants who had these comorbidities at baseline, however, there were no subgroup analyses conducted to determine the effect these conditions had on treatment outcomes.

The systematic review[19] and both primary studies included intervention arms with a limited number of participants (< 50). It is clear from the data that these small groups hindered the ability of studies to detect a statistically significant difference for their outcomes of interest.

As outlined in our inclusion criteria, all studies examined in this review included participants who had been assessed as at nutritional risk or diagnosed as malnourished. The effectiveness of nutritional interventions for the prevention of malnutrition in nutritionally healthy individuals is outside of the scope of this report.

Conclusions and Implications for Decision or Policy Making

One relevant systematic review with meta-analysis,[19] one partially randomized clinical trial,[20] and one non-randomized study[21] were identified regarding the clinical effectiveness of nutritional interventions for community-dwelling older adults who are malnourished or at nutritional risk.

Evidence from one partially randomized clinical trial[20] demonstrated that participants treated with a dietary intensive treatment had significantly lower costs of visits to primary care physicians and costs of visits to medical specialists than those given medical treatment or usual care at six-month follow-up. The same study also found that participants in the dietary intensive treatment group experienced greater improvements in their depression and cognitive function scores than the medical treatment and usual care groups. There were no relevant statistically significant findings in the systematic review[19] or in the non-randomized study.[21] There is a high degree of uncertainty in these findings due to the limitations outlined in this review, including the use of non-randomized data, the

open-label nature of included studies, and the small number of participants for whom data was available.

A large number of studies were excluded from this review because they focused on participants who were younger than 65 years of age or were not identified as malnourished or at nutritional risk. For example, both of the studies identified for inclusion in the previously completed summary of abstracts report[16] were excluded following full-text review. The Marshall et al.[28] systematic review was excluded because none of its included primary studies were both in the relevant patient population and included a control group. The Young et al.[29] non-randomized study was excluded as it did not include a control group.

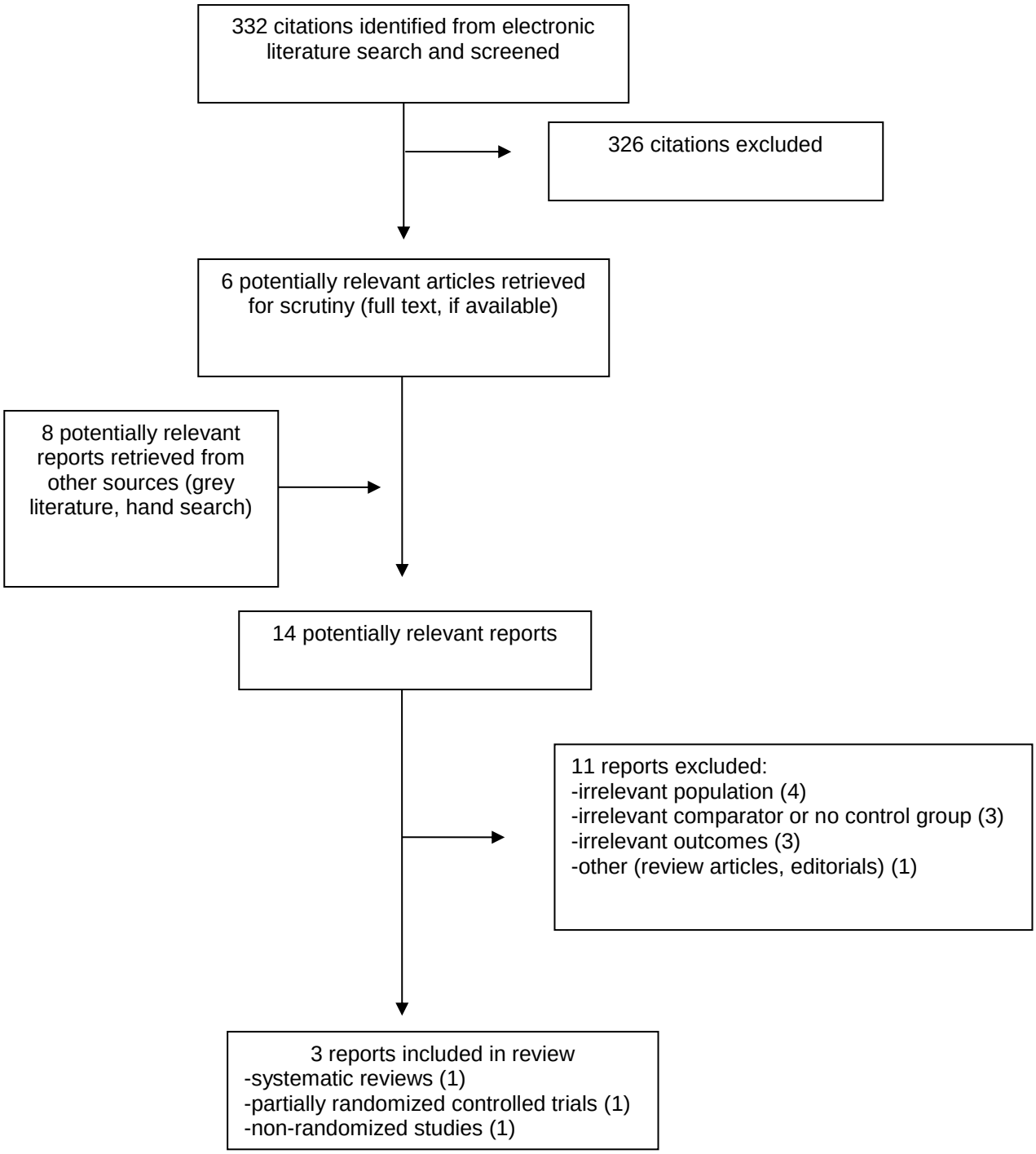
The applicability of the evidence base to Canadian settings is unclear as all studies were conducted outside of North America, however there is no strong evidence suggesting that the results would not generalize to Canadians who are malnourished or identified as at nutritional risk.

Although we sought to identify evidence on a wide variety of interventions, we identified literature on four: multidisciplinary nutritional interventions, dietary intensive treatment, medical treatment, and meal delivery service through Meals on Wheels. The effectiveness of other interventions, such as congregate dining programs, oral nutrition supplements, adult day programs with meal components, the provision of cooking classes, and nutritional education or counselling, is unclear due to the lack of identified evidence. Further research on these interventions, as well as larger trials with more statistical power on the interventions included in this review, may help reduce uncertainty.

References

1. Teitelbaum D, Guenter P, Howell WH, Kochevar ME, Roth J, Seidner DL. Definition of terms, style, and conventions used in A.S.P.E.N. guidelines and standards. *Nutr Clin Pract.* 2005;20(2):281-285.
2. Kaiser MJ, Bauer JM, Ramsch C, et al. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. *J Am Geriatr Soc.* 2010;58(9):1734-1738.
3. Zhu H, An R. Impact of home-delivered meal programs on diet and nutrition among older adults: a review. *Nutr Health.* 2013;22(2):89-103.
4. Batchelor F, Haralambous B, Lin X, Joosten M, Williams S, Malta S. Healthy ageing literature review. 2016; https://www2.health.vic.gov.au/about/publications/policiesandguidelines/healthy-ageing-literature-review. Accessed 2018 Dec 01.
5. Schultz TJ, Roupas P, Wiechula R, et al. Nutritional interventions for optimizing healthy body composition in older adults in the community: an umbrella review of systematic reviews. *JBI Database Syst Rev Implement Rep.* 2016;14(8):257-308.
6. Wright L, Vance L, Sudduth C, Epps JB. The impact of a home-delivered meal program on nutritional risk, dietary intake, food security, loneliness, and social well-being. *J Nutr Gerontol Geriatr.* 2015;34(2):218-227.
7. Volkert D. Malnutrition in the elderly — prevalence, causes and corrective strategies. *Clin Nutr.* 2002;21:110-112.
8. Hickson M. Malnutrition and ageing. *Postgrad Med J.* 2006;82(963):2-8.
9. Chen CCH, Tang ST, Wang C, Huang G-H. Trajectory and determinants of nutritional health in older patients during and six-month post-hospitalisation. *J Clin Nurs.* 2009;18(23):3299-3307.
10. Johansson L, Sidenvall B, Malmberg B, Christensson L. Who will become malnourished? A prospective study of factors associated with malnutrition in older persons living at home. *J Nutr Health Aging.* 2009;13(10):855-861.
11. Meydani M. Nutrition interventions in aging and age-associated disease. *Ann N Y Acad Sci.* 2001;928(1):226-235.
12. Hamirudin A, Charlton K, Walton K. Outcomes related to nutrition screening in community living older adults: a systematic literature review. *Arch Gerontol Geriatr.* 2016;62:9-25.
13. Ramage-Morin PL, Garriguet D. Nutritional risk among older Canadians. *Health Rep.* 2013;24(3):3-13.
14. Bandayrel K, Wong S. Systematic literature review of randomized control trials assessing the effectiveness of nutrition interventions in community-dwelling older adults. *J Nutr Educ Behav.* 2011;43(4):251-262.
15. Campbell AD, Godfryd A, Buys DR, Locher JL. Does participation in home-delivered meals programs improve outcomes for older adults? Results of a systematic review. *J Nutr Gerontol Geriatr.* 2015;34(2):124-167.
16. Marchand D, Argáez C. Interventions for malnutrition in seniors: clinical effectiveness, cost-effectiveness, and guidelines. Ottawa (ON): CADTH; 2018: https://cadth.ca/sites/default/files/pdf/htis/2018/RB1263%20Senior%20Malnutrition%20Interventions%20Final.pdf. Accessed 2018 Dec 01.
17. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ.* 2017;358:j4008. http://www.bmj.com/content/bmj/358/bmj.j4008.full.pdf. Accessed 2018 Dec 01.
18. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health.* 1998;52(6):377-384. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1756728/pdf/v052p00377.pdf. Accessed 2018 Dec 01.
19. Rasmussen NML, Belqaid K, Lugnet K, Nielsen AL, Rasmussen HH, Beck AM. Effectiveness of multidisciplinary nutritional support in older hospitalised patients: a systematic review and meta-analyses. *Clinical Nutr ESPEN.* 2018;27:44-52.
20. Endevelt R, Lemberger J, Bregman J, et al. Intensive dietary intervention by a dietitian as a case manager among community dwelling older adults: the EDIT study. *J Nutr Health Aging.* 2011;15(8):624-630.
21. Luscombe-Marsh N, Chapman I, Visvanathan R. Hospital admissions in poorly nourished, compared with well-nourished, older South Australians receiving 'Meals on Wheels': findings from a pilot study. *Australas J Ageing.* 2014;33(3):164-169.
22. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol.* 2009;62(10):e1-e34.
23. Beck A, Andersen U, Leedo E, et al. Does adding a dietician to the liaison team after discharge of geriatric patients improve nutritional outcome: a randomised controlled trial. *Clin Rehabil.* 2015;29(11):1117-1128.
24. Beck AM, Kjær S, Hansen BS, Storm RL, Thal-Jantzen K, Bitz C. Follow-up home visits with registered dietitians have a positive effect on the functional and nutritional status of geriatric medical patients after discharge: a randomized controlled trial. *Clin Rehabil.* 2013;27(6):483-493.
25. Visvanathan R, Macintosh C, Callary M, Penhall R, Horowitz M, Chapman I. The nutritional status of 250 older Australian recipients of domiciliary care services and its association with outcomes at 12 months. *J Am Geriatr Soc.* 2003;51(7):1007-1011.
26. Mahoney FI, Barthel DW. Functional evaluation: The Barthel Index. *Md State Med J.* 1965;14:61-65.
27. Feldblum I, German L, Castel H, et al. Characteristics of undernourished older medical patients and the identification of predictors for undernutrition status. *Nutr J.* 2007;6:37.
28. Marshall S, Bauer J, Capra S, Isenring E. Are informal carers and community care workers effective in managing malnutrition in the older adult community? A systematic review of current evidence. *J Nutr Health Aging.* 2013;17(8):645-651.
29. Young AM, Mudge AM, Banks MD, et al. From hospital to home: limited nutritional and functional recovery for older adults. *J Frailty Aging.* 2015;4(2):69-73.

Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Table 2: Characteristics of Included Systematic Reviews and Meta-Analyses

First Author, Publication Year, Country	Study Designs, Search Strategy, Numbers of Primary Studies Included, Quality Assessment Tool, and Objective	Population Characteristics	Intervention(s)	Comparator(s)	Clinical Outcomes, Length of Follow-Up
Rasmussen, 2018[19] Denmark	**Study design**: SR and MA that included controlled trials **Literature search strategy**: An initial search was conducted for literature published between January 2007 and November 2013 in six databases: The Cochrane Library, PubMed, CINAHL, Campbell Collaboration Library, Occupational Therapy Seeker, and Centre for International Rehabilitation Research Information and Exchange Databases". This was updated with a subsequent search using the same strategy to include studies published up to November 2014. Additional grey literature was identified by contacting experts in the field. A final search was conducted using PubMed on all studies included in the review (up to 23rd of June, 2018). **Number of primary studies**: In total, 5 controlled trials were included, with 2 RCTs relevant for our report. **Quality assessment tool**: Cochrane risk of bias **Objective**: to investigate the effectiveness of multidisciplinary nutritional support on mortality, hospital readmissions, and quality of life in patients aged 65 or older during hospitalization and after discharge versus usual care.	Elderly patients (≥65 years) who were hospitalized. In the studies relevant to our review, patients were identified as at risk for malnutrition, discharged into the community, and were monitored as they underwent intervention with a multidisciplinary nutritional intervention or usual care. **Number of patients**: the two relevant RCTs included a total of 223 participants **Mean age**: populations from relevant studies had mean ages ranging from 72 to 85 **Sex**: NR	*"Multidisciplinary nutritional interventions, defined as interventions incorporating nutrition as a clearly identified integral component by more than one profession"* (page 45) **Intervention duration:** 12 weeks in both relevant studies	Usual care Relevant studies defined usual care as 1 or 3 home visits without dietary counselling	**Outcome measures searched in the SR:** - Mortality - Readmissions - Quality of life - Nutritional status - Dropout rate - Adverse events **Outcome measures from relevant studies** - Mortality - Readmissions - Quality of life **Follow-up:** Relevant RCTs had follow-ups at 12 to 26 weeks

MA = meta-analysis; NR = not reported; RCT = randomized controlled trial; SR = systematic review.

Table 3: Characteristics of Included Primary Clinical Studies

First Author, Publication Year, Country	Study Design, Setting, and Objective	Patient Characteristics	Intervention(s)	Comparator(s)	Clinical Outcomes, Length of Follow-Up
Randomized Controlled Trials					
Endevelt, 2011[20] Israel	**Study design**: prospective, open-label, partially randomized clinical trial (two of three intervention groups were randomized) **Setting**: community-dwelling older individuals who were identified as at nutritional risk using the MNA were screened and recruited to the study via phone. **Objective**: *"to determine the impact of an intensive nutritional intervention program led by a dietitian on the health and nutritional status of malnourished community dwelling older adults"* [20] (page 624)	Older adults (≥75 years of age) who were living in the community and were identified as at nutritional risk (total serum cholesterol of <160 mg/dL, or a serum albumin level of <3.5 mg/dL, or a total lymphocyte count of <1800) **Number of patients**: 127 (35 in the DIT group; 33 in the MT group; 59 in the usual care group) **Mean age**: 84.5±5.6 in the DIT group; 84.2±6.0 in the MT group; 84.7±4.7 in the usual care group **Sex**: 60% female in the DIT group; 64% female in the MT group; 63% female in the usual care group **Mean BMI**: 27.4±5.2 kg/cm^2 in the DIT group; 27.3±5.0 kg/cm^2 in the MT group; 27.0±5.2 kg/cm^2 in the usual care group	- Dietary intensive treatment (DIT) An individualized treatment strategy was designed by a dietician according to the patient's medical and nutritional characteristics. Patients met with the dietician on a regular schedule for six months. - Medical treatment (MT) This group received treatment from a primary care physician as well as a booklet on nutrition education for older adults	Untreated nutrition group (usual care) This group received the standard of care of the HMS, which at the time of the study did not include any routine nutritional assessment or treatment	**Outcomes**: - Nutritional assessment (e.g., MNA score, FQQ score) - Various biochemical measurements (e.g., serum albumin, hemoglobin, cholesterol, total lymphocyte count) - Cost of health services (e.g., number of hospital admissions, number of primary care visits, use of medication) - Cognitive status (MMSE) - Depression score (GDS-sf) - Functional status (modified Barthel Index) **Follow-up**: 6 months after baseline assessment
Non-Randomized Studies					
Luscombe-Marsh, 2013[21] Australia	**Study design**: NRS, retrospective analysis **Setting**: data was collected from older individuals who were living independently and identified as poorly	Older adults (≥69 years of age) who were living independently and were identified as poorly nourished (MNA score < 24) **Number of patients**: 108 (28 in the MOW group; 80 in	Home-delivered meals from MOW	No delivery of meals from MOW	**Outcomes**: - Mortality - Change in living situation - Weight loss - Falls - Hospital admissions - Length of hospital stay

Table 3: Characteristics of Included Primary Clinical Studies

First Author, Publication Year, Country	Study Design, Setting, and Objective	Patient Characteristics	Intervention(s)	Comparator(s)	Clinical Outcomes, Length of Follow-Up
	nourished by the use of interviews at each participant's home. **Objective**: to assess whether delivery of food using the Meals on Wheels service reduced hospital admissions in poorly nourished older people	the non-MOW group) **Mean age**: 83±6 in the MOW group; 78±7 in the non-MOW group (total range = 69 to 99) **Sex**: 78.6% female in the MOW group; 71.3% in the non-MOW group **Mean BMI**: 23.9±4.4 kg/cm^2 in the MOW group; 24.8±5.8 kg/cm^2 in the non-MOW group			**Follow-up**: 12 months

BMI = Body Mass Index (kg/cm^2); DIT = dietary intensive treatment; FQQ = Food Frequency Questionnaire; GDS-sf = Geriatric Depression Screening Scale; HMS = Maccabi Healthcare Services; MMSE = Mini Mental State Examination; MNA = Mini Nutritional Assessment; MT = medical treatment; MOW = Meals on Wheels; NRS = non-randomized study.

Appendix 3: Critical Appraisal of Included Publications

Table 4: Strengths and Limitations of Systematic Reviews and Meta-Analyses using AMSTAR 2[17]

Strengths	Limitations
Rasmussen, 2018[17]	
• The objectives and inclusion/exclusion criteria were clearly stated and included components of population, intervention, comparator, and outcomes • Multiple databases were searched (The Cochrane Library, PubMed, Cumulative Index to nursing and Allied Health Literature, Campbell Collaboration Library, Occupational Therapy Seeker, and Centre for International Rehabilitation Research Information and Exchange Databases). In addition, experts in the field were contacted to assist in the identification of grey literature • Search strategy, terms, and dates were provided • Study selection and data extraction process was described and conducted in duplicate • Articles excluded after full-text review were listed and reasons for exclusion were provided • Characteristics of included studies were described in detail • Review authors assessed the quality of included studies using the Cochrane Collaboration's risk of bias tool • Meta-analysis was conducted with random effects model when there was variation in intervention and criteria for patient inclusion. A fixed-effect meta-analysis was undertaken for more homogenous studies. I^2 statistics were calculated when appropriate • The authors stated that they had no conflicts of interest related to this review	• It is unclear whether the review methods were established prior to conducting the review (no mention of a protocol) • Justification for including both randomized and non-randomized controlled studies was not provided • Review authors stated that the five included studies disclosed their source of funding; however, no information on who funded these studies was summarized in the review • Publication bias was not assessed due to the relatively low number of studies identified

Table 5: Strengths and Limitations of Clinical Studies using the Downs and Black Checklist[18]

Strengths	Limitations
Randomized Controlled Trials	
Endevelt, 2011[20]	
• The objectives, interventions, controls, and main outcomes are clearly described • Detailed methodology on patient recruitment and assessment of inclusion/exclusion criteria is included • Treatment and control groups were overall balanced in the baseline patient characteristics (e.g., sex, age, BMI, biochemical parameters) • Length of follow-up was consistent between the three groups (6 months) • Estimates of random variability (standard deviations) and actual probability values (*P*-values) were reported • Study participants, care providers, and setting appear to be representative of the population and care setting of interest • Patients in all groups were successfully screen through the same eligibility criteria and came from the same population • Results pertaining to cost of health care services were adjusted for age, functional status and gender • The trial's source of funding was provided (a grant from the National Institute for Health Policy Israel) • The authors stated that they had no conflicts of interest	• Although sample size calculations were conducted, an appropriate number of patients were not recruited to the intervention groups (51 estimated as needed vs 35 recruited to the medical treatment group) • The relatively small sample size (127 allocated to one of three intervention groups) used in this study may have limited its ability to reject the null hypothesis • Details on the methods for randomization are lacking • While two of the three intervention groups underwent a randomization process, the usual care group did not. Therefore this group is at risk of bias and inherent limitations present in non-randomized studies. For example, these participants may be more or less prone to confounding • Due to the nature of the intervention, patients and outcome assessors were not blinded to treatment assignment • It is unclear if there were any adverse events resulting from the interventions • Patient compliance with their assigned nutritional plan is unclear • Outcomes were not directly compared between the three groups. Instead, a test of the change from baseline for each outcome of interest was reported • There is no mention of patients lost to follow-up • It is unclear if an intention-to-treat analysis was conducted • The relatively short follow-up period of 6 months may not have been sufficient for the chronic condition of malnutrition
Non-Randomized Studies	
Luscombe-Marsh, 2013[21]	
• The objectives, interventions, controls, and main outcomes are clearly described • Limited information on the patient population is provided in the text; however, reference to the original study that includes complete details on participant recruitment and baseline characteristics is provided • Treatment and control groups were overall balanced in the baseline patient characteristics (e.g., sex, BMI, MNA score, comorbid diagnoses). A significant difference between groups was reported for age. • Length of follow-up was consistent between the three groups (12 months) • Confidence intervals and actual probability values (*P*-values) were reported • Study participants and setting appear to be representative of the population and setting of interest	• This was a retrospective analysis of data coming from two cohorts of individuals who either received or did not receive home-delivered meals through the Meals on Wheels program; therefore, patients were not randomized, leaving the study susceptible to bias due to uncontrolled confounding variables • Sample size calculations were not conducted • It is not possible to blind patients or those analyzing the data (which came from a previous study) • The reasoning behind the selection of age and BMI as confounding characteristics to adjust for in their analysis was poorly described • It is unclear if there were any adverse events resulting from the intervention • Patient compliance with home-delivered meal plans cannot be estimated

Table 5: Strengths and Limitations of Clinical Studies using the Downs and Black Checklist[18]

Strengths	Limitations
• Results were adjusted for age and BMI as confounders due to baseline differences • There was no loss to follow-up due to the study's retrospective cohort design • The authors stated that they had no conflicts of interest and no relevant financial interest in this study	• The Meals on Wheels group (N = 28) included a substantially smaller number of individuals than the non-Meals on Wheels group (N = 80)

BMI = Body Mass Index; MNA = Mini Nutritional Assessment; N = number of participants.

Appendix 4: Main Study Findings and Authors' Conclusions

Table 6: Summary of Findings Included Systematic Reviews and Meta-Analyses

<table>
<tr><th>Main Study Findings</th><th>Authors' Conclusion</th></tr>
<tr><td colspan="2">Rasmussen, 2018[17]</td></tr>
<tr><td>Systematic review investigating the effectiveness of multidisciplinary nutritional interventions for the treatment of malnutrition.

Relevant primary studies: The systematic review included two relevant RCTs[23,24] on the use of multidisciplinary nutritional interventions for the treatment of elderly individuals (≥65 years) identified as at risk for malnutrition.

Findings: The systematic review presented results on hospital readmission rates, mortality, and quality of life that could be extracted for the relevant studies

Comparison of multidisciplinary nutritional interventions (MNI) versus usual care (UC) with respect to several outcomes
<table>
<tr><th rowspan="2">Primary study citation</th><th colspan="2">Result</th><th rowspan="2">Significance (P-value)</th></tr>
<tr><th>MNI group</th><th>UC group</th></tr>
<tr><td colspan="4">Readmission Rate</td></tr>
<tr><td>Beck, 2015 (N = 71)</td><td>Follow-up (26 weeks): 28%</td><td>Follow-up (26 weeks): 52%</td><td>0.07</td></tr>
<tr><td>Beck, 2013 (N = 152)</td><td>Follow-up (26 weeks): 53%</td><td>Follow-up (26 weeks): 42%</td><td>0.07</td></tr>
<tr><td colspan="4">Mortality</td></tr>
<tr><td>Beck, 2015 (N = 71)</td><td>During intervention: 3%
Follow-up (26 weeks): 6%</td><td>During intervention: 5%
Follow-up (26 weeks): 16%</td><td>NS
NS</td></tr>
<tr><td>Beck, 2013 (N = 152)</td><td>Follow-up (26 weeks): 6%</td><td>Follow-up (26 weeks): 9%</td><td>NS</td></tr>
<tr><td colspan="4">Quality of Life*</td></tr>
<tr><td>Beck, 2015 (N = 71)</td><td>NR</td><td>NR</td><td>NS</td></tr>
</table>
*The outcome measure used to assess quality of life was not described in the systematic review.
MNI = multidisciplinary nutritional interventions; N = number of patients; NR = not reported; NS = non-significant; UC = usual care.</td><td>"Although a small number of studies and a relatively small sample size, a suggestion is that provision of multidisciplinary nutritional support may have a positive effect on mortality and improves quality of life in older patients. There is a need for more high-quality studies including multidisciplinary nutritional support to verify these findings" [17] (p44)</td></tr>
</table>

MNI = multidisciplinary nutritional interventions; RCT = randomized controlled trial; UC = usual care.

Table 7: Summary of Findings of Included Primary Clinical Studies

<table>
<tr><th>Main Study Findings</th><th>Authors' Conclusion</th></tr>
<tr><td colspan="2">Randomized Controlled Trials</td></tr>
<tr><td colspan="2">Endevelt, 2011[20]</td></tr>
<tr><td>
Partially randomized study investigating two modes of nutritional intervention compared to usual care for community dwelling older adults (≥75 years) identified as at nutritional risk. Participants were randomly assigned to receive either dietary intensive treatment (DIT) or medical treatment (MT). A third non-randomized usual care (UC) group was formed using individuals who did not go through the randomization process for various reasons.

Comparison of treatment with DIT, MT, and UC with respect to several he health status characteristics
<table>
<tr><th rowspan="3">Outcome measure</th><th colspan="3">Mean value (SD)</th><th rowspan="3">Significance (P-value)*</th></tr>
<tr><th colspan="3">Intervention group</th></tr>
<tr><th>DIT (N = 59)</th><th>MT (N = 35)</th><th>UC (N = 33)</th></tr>
<tr><td>No. of diagnoses
Pre-treatment
Follow-up (6 months)</td><td>
2.4 (1.4)
2.7 (1.4)</td><td>
3.6 (2.5)
3.8 (2.5)</td><td>
4.2 (1.8)
4.0 (1.8)</td><td>

0.8</td></tr>
<tr><td>No. of prescribed medications
Pre-treatment
Follow-up (6 months)</td><td>
6.9 (2.2)
6.3 (2.8)</td><td>
6.0 (3.2)
5.9 (3.0)</td><td>
5.2 (2.6)
5.0 (2.3)</td><td>

0.8</td></tr>
<tr><td>Physical functioning score
Pre-treatment
Follow-up (6 months)</td><td>
87.3 (12.4)
86.9 (10.1)</td><td>
95.1 (9.5)
94.9 (9.0)</td><td>
96.1 (9.9)
95.1 (9.2)</td><td>

0.4</td></tr>
<tr><td>Depression score
Pre-treatment
Follow-up (6 months)</td><td>
7.3 (3.9)
5.4 (3.9)</td><td>
6.0 (4.0)
6.3 (4.0)</td><td>
6.8 (6.4)
6.6 (5.9)</td><td>

0.04</td></tr>
<tr><td>Cognitive function score
Pre-treatment
Follow-up (6 months)</td><td>
25.8 (4.5)
26.8 (4.0)</td><td>
27.0 (3.4)
27.3 (3.8)</td><td>
27.6 (3.0)
28.0 (3.3)</td><td>

0.04</td></tr>
</table>
*P-values represent the results of an ANOVA test of the change from baseline in each parameter.
Notes: Functional status, depression, and cognitive function were assessed using the modified Barthel Index, the Geriatric Depression Screening Scale (GDS-sf), and the Folstein MMSE respectively. Participants were randomized to the DIT and MT groups; however, patients in the UC did not go through a randomization process.
DIT = dietary intensive treatment; MT = medical treatment; N = number of patients; SD = standard deviation; UC = usual care.

Comparison of treatment with DIT, MT, and UC with respect to several health care utilization outcomes after 6 months of follow-up
<table>
<tr><th rowspan="3">Outcome measure</th><th colspan="3">Mean cost (SD)*†</th><th rowspan="3">Significance (P-value)</th></tr>
<tr><th colspan="3">Intervention group</th></tr>
<tr><th>DIT (N = 59)</th><th>MT (N = 35)</th><th>UC (N = 33)</th></tr>
<tr><td>Cost of patient visits to primary care physicians</td><td>173.2 (232.0)</td><td>420.4 (368.0)</td><td>429.1 (382.3)</td><td>0.005</td></tr>
<tr><td>Cost of patient visits to medical specialists</td><td>65.5 (155.0)</td><td>325.5 (617.7)</td><td>324.7 (354.9)</td><td>0.03</td></tr>
<tr><td>Cost of hospital admissions</td><td>1112.6 (1296.0)</td><td>1675.6 (2203.0)</td><td>1555.2 (2730)</td><td>0.15</td></tr>
<tr><td>Cost of medications</td><td>1660.3 (1010.0)</td><td>2187.4 (2809.1)</td><td>2192.3 (1905.2)</td><td>0.49</td></tr>
</table>
</td><td>
"The results of the study indicate that intensive dietary intervention led by a registered dietitian yields significant improvement in cognitive function, depressive symptoms, diet quality, and health care outcomes and economy." [20] (p628)
</td></tr>
</table>

Table 7: Summary of Findings of Included Primary Clinical Studies

<table>
<tr><th>Main Study Findings</th><th>Authors' Conclusion</th></tr>
<tr><td>*After adjustment for age, functional status, and gender.
†Cost values are in U.S. dollars.
Notes: Participants were randomized to the DIT and MT groups; however, patients in the UC did not go through a randomization process.
DIT = dietary intensive treatment; MT = medical treatment; N = number of patients; SD = standard deviation; UC = usual care.</td><td></td></tr>
<tr><td colspan="2">Non-Randomized Studies</td></tr>
<tr><td colspan="2">Luscombe-Marsh, 2013[21]</td></tr>
<tr><td>Non-randomized study investigating whether meal delivery service through 'Meals on Wheels' (MOW) improves health and reduces hospital admissions in poorly nourished older (≥69 years) individuals.

Comparison of the non-MOW group and the MOW group with respect to several outcomes
<table>
<tr><th rowspan="2">Outcome measure</th><th colspan="2">Intervention group</th><th rowspan="2">Odds Ratio (95% CI)*</th><th rowspan="2">Significance (P-value)*</th></tr>
<tr><th>Non-MOW (N = 80)</th><th>MOW (N = 28)</th></tr>
<tr><td>Weight loss experienced (%)</td><td>33.8</td><td>50.0</td><td>0.5 (0.2–1.2)</td><td>0.200</td></tr>
<tr><td>Experienced a fall (%)</td><td>36.3</td><td>35.7</td><td>0.9 (0.3–2.5)</td><td>0.800</td></tr>
<tr><td>Patients admitted to hospital (%)</td><td>42.5</td><td>28.6</td><td>1.5 (0.5–4.4)</td><td>0.400</td></tr>
<tr><td>Patients who required a hospital stay >14 days (%)</td><td>39.1</td><td>30.4</td><td>1.4 (0.4–4.1)</td><td>0.600</td></tr>
</table>
*After adjustment for age and BMI as confounders.
CI = confidence interval; MOW = Meals on Wheels; N = number of patients.</td><td>"In conclusion, these preliminary data indicate that the provision of MOW to nutritionally vulnerable older people may not prevent age-related decline in health, but, importantly, it does imply that MOW may be a cost-effective strategy to reduce hospital readmissions and durations of hospital stays. Accordingly, further investigation using an appropriately designed randomised control trial is warranted." (p168)</td></tr>
</table>

BMI = body mass index; DIT = dietary intensive treatment; MOW = Meals on Wheels; MMSE = Mini Mental State Examination; MT = medical treatment; UC = usual care.

CADTH

Appendix 5: Additional References of Potential Interest

Previous CADTH Reports

Nutritional interventions for the delayed progression or reversal of frailty: clinical effectiveness. Ottawa: CADTH; 2018 May (*CADTH rapid response report: summary of abstracts*): https://cadth.ca/sites/default/files/pdf/htis/2018/RB1222%20Frailty%20-%20Nutrition%20Interventions%20Final.pdf. Accessed 2018 Dec 01.

Oral nutrition intake for the prevention of falls in older adults: clinical effectiveness and guidelines. Ottawa: CADTH; 2014 Mar (*CADTH rapid response report: list of references*): https://cadth.ca/sites/default/files/pdf/htis/nov-2014/RA0671%20Oral%20Nutritional%20Intake%20Final.pdf. Accessed 2018 Dec 01.