A Systematic Review of Health Economic Evaluations of Oral Nutritional Supplements as a Single-Component or Multi-Component Intervention in Older Adults With or at Risk of Malnutrition

EE335

ISPOR Special Interest Group

ISPOR Nutrition Economics Special Interest Group Key Project

Desai A[1], Dong OM[2], Gautier S[3], Johnson T[4], Wong A[5], Osman AMY[6], Harvey J[7], Tran TH[8], Holladay Ford DM[9], Kerr KW[10], Aggarwal A[11], Mauskopf J[12]

[1]Nestlé Health Science, Bridgewater, NJ, USA, [2]RTI Health Solutions, Research Triangle Park, NC, USA, [3]ISPOR - The Professional Society for Health Economics and Outcomes Research, Lawrenceville, NJ, USA, [4]Rush University, Chicago, IL, USA, [5]Changi General Hospital, Simei, Singapore, [6]International Islamic University Malaysia, Kuantan, Pahang Darul Makmour, Malaysia, [7]Harvard Pilgrim Health Care Institute and Harvard Medical School, Boston, MA, USA, [8]University of Maryland School of Pharmacy, Baltimore, MD, USA, [9]Center for Improving Value in Health Care, Denver, CO, USA, [10]Abbott Nutrition, Columbus, OH, USA, [11]IQVIA, Gurgaon, DL, India, [12]RTI International, Research Triangle Park, NC, USA

BACKGROUND

- Malnutrition is an acute, subacute, or chronic nutritional state that occurs when dietary intake is insufficient in meeting current dietary needs or when nutrient utilization is impaired.[1]
- The increased morbidity and mortality associated with malnutrition has been shown to lead to higher healthcare resource use and higher clinical, humanistic and economic burden to patients, society and healthcare systems.[2]
- Older adults (defined as age ≥ 60 years) are at an increased risk of malnutrition because of factors associated with the physiological changes that occur during the aging process, the accumulation of diseases and impairments over time, and psychosocial factors that can impact dietary intake.[3]
- Oral nutrition supplements (ONS) are medical nutrition products recommended for individuals with or at risk of malnutrition who can consume foods orally but may be unable to meet their nutrient needs through diet alone.[4]
- The health economic evidence of ONS interventions among older adults with or at risk of malnutrition has not been well elucidated in the literature.

OBJECTIVE

- This systematic literature review (SLR) summarizes key findings from health economic evaluations in older adults with or at risk of malnutrition receiving ONS interventions.

METHODS

- This review utilized six electronic databases (PubMed, Embase, EconLit, CINAHL, Cochrane, Scopus) to identify health economic evaluations comparing ONS vs. any comparators among older adults published between January 2014-February 2024.
- The inclusion criteria were defined using the Population, Interventions, Comparators, Outcomes, Study design (PICOS) framework **(Table 1).**
- The Consolidated Health Economic Evaluation Reporting Standards (CHEERS) checklist informed data extraction and reporting quality.
- Methodological quality of studies was assessed using the Drummond 10-item checklist.
- This study was registered with PROSPERO (CRD42023459161).

Table 1. Study Eligibility Criteria (PICOS)

Characteristic	Inclusion Criteria	Exclusion Criteria
Population	▪ Predominantly older adult cohorts (mean age ≥ 60 years)[a]	▪ Children, cohorts with mean age < 60 years
Intervention	▪ Any ONS intervention	▪ Enteral tube feeding, parenteral nutrition
Comparators	▪ Any comparator, no intervention (e.g., standard of care [SOC])	
Outcomes	▪ Nutritional, functional, or clinical and economic outcomes	
Study Design	▪ Health economic evaluations	▪ Clinical effectiveness only ▪ Animal studies
Timing	▪ Any duration	
Setting	▪ Any setting	
Other	▪ Publication date: 2014 – current ▪ Language: English ▪ Geographical location: no limit ▪ Reference check of relevant SLRs	▪ Language other than English ▪ Abstract only ▪ Conference proceedings

[a] Given the limited number of studies conducted exclusively in older adult populations, cohorts that were predominantly older adults were included.

Presented at ISPOR Europe | 17-20 November 2024 | Barcelona, Spain
No funding was received for this study.

Key Takeaway: Oral nutritional supplement interventions among older adults with or at risk of malnutrition in hospital and community settings have been shown to be cost-effective or result in cost savings and improve health outcomes.

RESULTS

Literature Search Results (Figure 1)

- Of the 1,459 records identified and screened, 12 studies met the inclusion criteria (4 cost-effectiveness analyses [CEA], 2 cost-utility analyses [CUA], 3 budget-impact analyses [BIA], 1 cost-minimization analysis [CMA], 1 CEA plus CUA, 1 BIA plus CEA).

Overview of Included Studies (Table 2)

- Studies were conducted in hospital settings (n=6) in different countries (n=7), had time horizons ≤6 months (n=10), were trial-based (n=8), had usual care as comparators (n=10), and included both healthcare and intervention costs (n=11).
- Across all studies, ONS intervention costs were low, resulting in lower or slightly higher total healthcare costs.
- In 11 studies, ONS interventions had improved overall patient health outcomes vs. comparators (e.g., significantly faster pressure ulcer healing at 8 weeks).
- In 6 studies that reported quality-adjusted life-years (QALYs), ONS interventions resulted in slightly higher QALYs vs. comparators (e.g., 3-month incremental QALY gain of 0.011).

Quality Assessment

- Of the items that were applicable to studies, the overall mean percentage of completed CHEERS and Drummond 10-item checklist items for each study was 74% and 69%, respectively.

Figure 1. PRISMA Flow Diagram

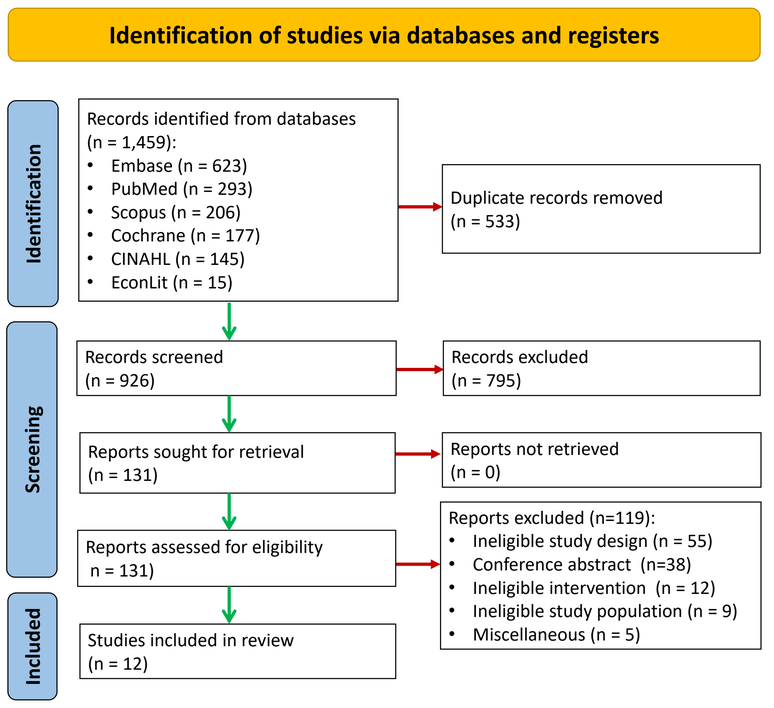

Table 2. Summary of Included Studies

Reference; Country	Analysis Type	Setting	Perspective	Main Comparison	Currency, Year	Main Time Horizon	Main Cost Impacts[a]	Main Health Impacts[a]	Author Conclusion[b]
Acute Settings									
Milte et al., 2016[5]; Australia	CUA of RCT	Hospital	AU healthcare sector	Patient care plan intervention[c] vs. usual rehabilitation advice[d]	AU $, 2010	6 months	• Total cost of patient care plan intervention arm (vs. usual rehabilitation advice): $45,331 (vs. $44,764) • Intervention cost: $1,125 • ONS cost: not reported separately	• Patient care plan intervention (vs. usual rehabilitation advice) QALYs: 0.155 (vs. 0.139) • Patient outcomes not significantly different between intervention and comparator groups	Patient care plan intervention was likely cost-effective, although the findings were highly uncertain
Sulo et al., 2017[6]; US	BIA of RWE study	Hospital	US hospital and integrated delivery network	QIP intervention[c] vs. usual care	US $, (year not specified)	6 months	• Hospital readmission rates and hospital length of stay for QIP intervention (vs. usual care) $439-$674 and $1,131-$3,255 net savings/treated patient, respectively • Intervention cost: $71 • ONS cost: not reported separately	• QIP intervention (vs. usual care): 50-77 additional avoided hospital readmissions and 0.64-1.8 difference in shorter hospital length of stay	QIP intervention reduced the per-patient healthcare costs by avoiding 30-day readmissions and through reduced length of stay
Zhong et al., 2017[7]; US	CEA of RCT	Hospital	US healthcare payer	ONS intervention plus SOC vs. placebo plus SOC[d]	US $, 2015	90 days[e]	• Total cost of ONS intervention arm (vs. SOC): $22,506 (vs. $22,133) • Intervention cost (i.e., ONS cost): $283	• QALY gain of 0.011 for ONS intervention (vs. SOC) • LY gain of 0.71 for ONS intervention (vs. SOC) over lifetime	ONS intervention was cost-effective
Ballesteros-Pomar et al., 2018[8]; Spain	CEA of RCT	Hospital	Spanish National Health System	ONS intervention plus SOC vs. placebo plus SOC[d]	Spain €, 2016	90 days[e]	• Total cost of ONS intervention arm (vs. SOC): €6,706 (vs. €6,373) • Intervention cost (i.e., ONS cost): €360	• ONS intervention (vs. SOC) LYs: 0.240 (vs. 0.230) • QALY gain of 0.011 for ONS intervention (vs. SOC)	ONS intervention was cost-effective
Sharma et al., 2018[9]; Australia	CEA and CUA of RCT	Hospital and post-discharge	Third party payer (Australian Medicare)	Extended nutritional intervention[c] vs. usual care	AU $, 2016/2017	3 months	• Total cost of extended nutrition intervention arm (vs. usual care): $15,029 (vs. $15,936) • Intervention cost: $286 • ONS cost: not reported separately	• Extended nutrition intervention (vs. usual care) difference in PG-SGA: 1.3 units improvement • Extended nutrition intervention (vs. usual care) difference in QALY gain: 0.005	Extended nutritional intervention was dominant in both CEA and CUA
Sulo et al., 2022[10]; Colombia	BIA and CEA of RWE study	Hospital outpatient	Colombian third-party payer	QIP intervention[c] vs. usual care	US $, 2019	90 days	• Total cost of QIP intervention arm (vs. usual care): $279 (vs. $489) • Intervention cost: $116 • ONS cost: not reported separately	• Relative risk reduction of 43% for overall healthcare utilization (hospitalization, emergency department visits, outpatient visits) • QALYs for QIP intervention (vs. usual care): 0.187 (vs. 0.179)	QIP intervention resulted in cost savings for BIA and was dominant for CEA
Other Settings									
Simmons et al., 2015[11]; US	CEA of RCT	Skilled nursing home	US skilled nursing facility	ONS intervention[c] plus usual vs. usual care	US $, 2012	24 weeks	• Total cost of ONS intervention arm (vs. usual care): $3 higher/person/day • Intervention cost: same as total cost reported above • ONS cost: not reported separately	• Between-meal intake and total caloric intake significantly higher for ONS intervention (vs. usual care): ONS intervention on average 265 calories/person and 253 calories/person higher than usual care, respectively	ONS intervention was cost-effective in increasing caloric intake
Cereda et al., 2017[12]; Italy	CEA of RCT	Long-term care facility or home-based care	Local health care system in single region of Italy	Experimental ONS intervention plus usual care vs. control ONS plus usual care	Italy €, 2013	8 weeks	• Total cost of experimental ONS intervention arm (vs. control ONS): €2,008 (vs. €2,082) • Intervention cost (i.e., ONS cost): experimental ONS (vs. control ONS) €213 (vs. €173)	• Experimental ONS intervention (vs. control ONS): significantly greater percentage reduction in pressure ulcer size (mean group difference: 22%) and proportion achieving a reduction in area ≥40% (mean group difference: 24%)	Experimental ONS intervention was dominant
Pouyssegur et al., 2017[13]; France	CMA of RCT	Assisted living	French healthcare payer	ONS intervention plus standard institutional diet vs. standard institutional diet[d]	France €, 2014	18 weeks	• Total cost of ONS intervention arm (vs. standard diet group): €885 (vs. €1,076) • Intervention cost (i.e., ONS cost): €63	• The probabilities of diarrhea, falls, and infections were lower in the ONS intervention group. The probability of bed sores was higher in the ONS intervention group	ONS intervention resulted in improvement in nutritional status and decrease in expenses
Elia et al., 2018[14]; UK	CUA of RCT	Care homes	Not reported	ONS intervention[c] plus dietary advice vs. dietary advice only	UK £, 2016	12 weeks	• Total cost of ONS intervention plus dietary advice arm (vs. dietary advice only): £377 (vs. £186) • Intervention cost: not reported separately • ONS cost (2009 £): £162	• ONS intervention plus dietary advice (vs. dietary advice) QALYs: 0.130 (vs. 0.113) • Change in QALYs were associated with significant weight gain in the ONS intervention plus dietary advice group	ONS intervention was cost-effective
Brown et al., 2020[15]; UK	BIA of RWE study	Community	UK health system	ONS plus dietary advice intervention[c] vs. routine care[d]	UK £, 2016	6 months	• Cost saving for ONS plus dietary advice intervention arm (vs. routine care): £997 • Intervention cost: £350 • ONS cost: £250	• ONS plus dietary advice intervention (vs. routine care): reductions in hospital admissions, length of hospital stay, number of general physician contacts, number of provider visits, and antibiotic prescriptions	ONS plus dietary advice intervention for high-risk patients resulted in cost savings
Sulo et al., 2020[16]; US	BIA of RWE study	Home healthcare	US hospital system	QIP intervention[c] vs. control group[d]	US $, 2017	30 days	• Total cost of QIP intervention arm (vs. control group): $4,141 (vs. $5,699) • Intervention cost: $261 • ONS cost: $110	• QIP intervention (vs. control group): relative risk lower after program implementation for inpatient and outpatient visits; relative risk higher after program implementation for emergency department visits	QIP intervention resulted in cost savings

Abbreviations: AU: Australia; LY: life year; PG-SGA: Patient-Generated Subjective Global Assessment; QIP: quality improvement program; RCT: randomized controlled trial; RWE: real-world evidence; UK: United Kingdom; US: United States.

[a] Unless noted, outcomes are expressed as per patient over the time frame indicated in the "Main Time Horizon" column, and costs are expresesed in the currency and year indicated in the "Currency, Year" column. The total cost of the intervention arm includes the cost of the ONS intervention plus relevant general healthcare costs for all studies except for Simmons et al., 2015[11], which only included ONS intervention costs and did not include general healthcare costs. [b] A dominant intervention is less expensive and more effective than the comparator. Author conclusions reflect results from base-case and sensitivity analyses except for the BIA of Sulo et al., 2022[10] where only a base-case analysis was completed. [c] Intervention was multi-component and included an ONS component. [d] Comparator is considered usual care. [e] Sensitivity analyses included time horizons > 6 months.

CONCLUSIONS

- All studies concluded ONS intervention was cost-effective (n=5) or cost saving (n=7).
- ONS improves patient outcomes for at-risk or malnourished older adults in hospital and community settings at low costs to healthcare systems.
- Future studies with longer time horizons are needed to characterize longer-term benefits and costs of ONS interventions.

REFERENCES

ASPEN. Definitions: Malnutrition. 2024. Accessed 16 Sep 2024. **2.** Medical Nutrition International Industry. Better care through better nutrition: value and effects of medical nutrition. Brussels, Belgium: 2018. Accessed 16 Sep 2024. **3.** Dorner B, et al. *J Acad Nutr Diet*. 2018 Apr;118(4):724-735. **4.** Volkert D, et al. *J Clin Med*. 2019 Jul 4;8(7). **5.** Milte R, et al. *J Rehabil Med*. 2016;48(4):378-385. **6.** Sulo S, et al. *Am Health Drug Benefits*. 2017 Jul;10(5):262-270. **7.** Zhong Y, et al. *Appl Health Econ Health Policy*. 2017;15(1):75-83. **8.** Ballesteros-Pomar MD, et al. *Nutrients*. 2018;10(2). **9.** Sharma Y, et al. *BMC Geriatr*. 2018;18(1):41. **10.** Sulo S, et al. *Value Health Reg Issues*. 2022;32:70-77. **11.** Simmons SF, et al. *J Am Geriatr Soc*. 2015; 63(11):2308-2316. **12.** Cereda E, et al. *Clin N* 2017;36(1):246-252. **13.** Pouyssegur, et al. *Eur Geriatr Med*. 2017;8(3). **14.** Elia M, Parsons EL, et al. *Clin Nutr*. 2018;37(2):651-658. **15.** Brown F, et al. *J Nutr Health Aging*. 2020;24(3):305-311. **16.** Sulo S, et al. *Am Health Drug Benefits*. 2020;13(3):95-101.