Community-based complex interventions to sustain independence in older people, stratified by frailty:
a systematic review and network meta-analysis (NIHR128862; CRD42019162195)
Supplementary material 11. Health economic evaluations and results

Health economic evaluations and results

Table 1. Economic evaluation analysis and principal findings reported for the short-term time horizon

Study	Intervention 1 (Int1) *(Experimental intervention)*	Intervention 2 (Int2) *(comparator)*	Perspective	Time horizon (months)	Cost analysis	Cost-effectiveness analysis	Cost-utility analysis	Cost-benefit analysis	Health sector costs	Other sector costs	Patient and family costs	Productivity impacts	Intervention cost items	Currency / Price year / Principal findings / Conclusion of study	Study conclusion[b]
														Evaluation[a] type and **Cost items category[a]**	
Clark 1997[1]	eng & educ n = 51/51	ac n = 112/112	Soc (inc. HSCS)	9	●		●		●	● Paid caregiver only	● Unpaid caregiver only		Int1: Staff time spent on preparation, contacts, and travelling; Int2: Staff time spent on preparation and contacts	**Currency / Price year**: USD$, 1995; annual discount rate of 3% for costs **Total costs** (annualised mean per person): *(during treatment) Int1*: $4741 (SD $11,654), *Int2*: $4723 (SD $11,321) **Conclusion**: "Preventive OT demonstrated cost-effectiveness in conjunction with a trend toward decreased medical expenditures." **Notes:** Post-treatment total costs and ICER were estimated at 15 months.	✓
Clark 2012[2]	eng & educ n = 232/232	ac n = 228/228	HSCS	6	●		●		● Experimental intervention costs only				Salaries of intervention therapists	**Currency / Price year**: USD$, 2007-8 **Experimental intervention costs** (mean per person): $783 (approx. £472.5) **ICER** (per QALY): $41,218 (approx. £24,868), a number within the range that is often considered cost-effective by the UK NICE. **Conclusion**: "A lifestyle-oriented occupational therapy intervention has beneficial effects for ethnically diverse older people recruited from a wide array of community settings. Because the intervention is cost-effective and is applicable	✓

													on a wide-scale basis, it has the potential to help reduce health decline and promote well-being in older people."	
Melis 2008[3] n = 85/88	mfar(w/med)	ac n = 66/67	HSCS	6	●	●		●	●	●			Staff time spent on Consultation, phone calls, traveling, and administration	**Currency / Price year:** EUR€, 2005 **Total cost** (mean per person): *Int1*: €9713(SD €10,205), *Int2*: €8952(SD €9757); *mean difference*[c]: €761 (95% CI €-3336 to €4687) **Experimental intervention costs** (mean per person): €998 (95% CI €888 to 1108) **ICER** (per successful treatment[d]): €3418 (95% CI €-21,458 to 45,362) **CE plane**: 34.6% ICERs in southeast quadrant[e] **WTP**: ICER is roughly €3500 per successful treatment. The new treatment is cost-effective at a WTP of €34,000. **Conclusion**: "The results of this economic evaluation suggest that DGIP is an effective addition to primary care for frail older people at a reasonable cost."	✓
Tuntland 2015[4]	hmcr & ADL & aids & mfa-(w/slfm) n = 25/31	hmcr & mfa- n = 21/30	HSCS	9	●	●[f]		●	● Home visits from healthcare professionals only	● Home care only			Staff time spent on home visits	**Currency / Price year:** NOK, (assumed) 2012-4 **Total costs** (mean per person, 3-9 months post-intervention phase only): *Int1*: 6470.82 (SD 10,559.00) NOK, *Int2*: 13914.31 (SD 28,926.05) NOK; *mean difference*[c]: -7443.23 NOK **Intervention costs** (mean per person): *Int1*: 6322.78 (SD 4101.98) NOK, *Int2*: 7456.77 (SD 12,952.97) NOK; *mean difference*: -1134.00 NOK **Conclusions**: "We conclude that reablement stands out as a promising intervention, not only because it seems to decrease expenditure, but also because older adults feel they improve their performance and satisfaction in daily life activities. The combination of lower costs and higher effects is the kind of policy measure that will be of interest to policy-makers. Reablement is a	✓

more cost-effective intervention compared with usual care. Reablement has a potentially large effect on the demand for compensating home-based care services. Policy-makers should therefore consider implementing reablement on a larger scale."[5]

Study														
Stewart 2005[6]	mfa-n = 160/160	mfa-n =161/161	HSCS	8	●	●	●		●		● Also social services, equipment and adaptations	● Out-of-pocket expenses only, e.g., non-prescription medications, travel, additional household costs.		Not specified but analysed as part of total costs	**Currency / Price year**: GBP£ (£1 = US $1.59 = EUR €1.47), 2001; reported no discounting Total costs (mean per person): *Int1*: £4379 (SD £4173), *Int2*: £3837 (SD £4736); *mean difference*[c]: £543 (95% CI -434 to 1519) **CEA curve**: At best, occupational therapy assessment would improve outcomes at a cost of £14,000 per QALY. The probability of such an outcome was <50% (similar results presented for distribution of values of ICER based on Community Dependence Index (CDI) from bootstrap estimation). **Conclusions**: "From a policy perspective, the lack of difference in clinical and cost-effectiveness means that either a social work or an occupational therapy service is successful in making care assessments that enable an older person to remain in their own home."	X
van der Pols-Vijlbrief 2017[7]	hmcr & ntr & mfar n = 79/79[f]	hmcr n = 76/76[g]	Soc (inc. HSCS)	6	●		●	●	●		●	● Informal care only		Implementing action plan, staff time needed for support and visits	**Currency / Price year**: EUR€, 2014; reported no discounting **Total costs** (mean per person): *Int1:* €2770 (SE €347), *Int2*: €3044 (SE €325); *mean differenc*[c]: €-274, 95% CI €-1111 to €782. **Experimental intervention costs** (mean, per person): €41 (SE €0.47) **ICER** (per QALY): €-32173 **CE plane:** 55% cost-effect pairs in southeast quadrant, 21% northeast, 18% in southwest, 6% in northwest quadrants[e]. **CEA curve**: Probability of cost-effectiveness 0.80 at a WTP of €20,000/QALY gained.	X

Study														
													Conclusion: "The intervention cannot be considered cost-effective in comparison with usual care for […] QALYs gained. [It] showed stronger effects in participants who completed the intervention and actually executed the recommendations given. Therefore, future studies should take into account motivation and capability as potential key factors for a successful intervention."	
Wong 2019[8]	mfar(w/sl fm) n = 230/271	ac n = 229/269	HSCS	6	●		●	●	●		● Private GP visits only		(Int1) Staff time on staff training, staff time on intervention delivery (home visits, calls, administration), equipment; (Int2) Staff time on staff training, staff time on intervention delivery (calls)	**Currency / Price year**: HKD$, 2018 **Total costs** (mean per person): *Int1*: $3979, *Int2*: $3623; *mean difference*[c]: $356; 95% CI $272 to $440. **Intervention costs** (mean per person): *Int1*: $1263, *Int2*: $68 **ICER** (per QALY): $109,453 (95% CI $83,719 to $135,189) **CE plane**: 12.0% ICERs in the southeast quadrant[e]. **CEA curve**: The preventive self-care health management program had a 53.2% likelihood of being cost-effective when considering the NICE threshold ($200,000/QALY), and a 53.4% likelihood of being cost-effective compared to WHO (Hong Kong GDP/capita, $381,780) **Conclusion**: "The results provide some evidence to suggest that the addition of a home-based, preventive self-care health management program may have effects on cost outcomes for community-dwelling older adults in Hong Kong."	~
Challis 2004 2004[9]	mfar(w/med) n =129/129	mfar n =127/127	Soc (inc. HSCS)	6	●		●	●		● Personal consumption, housing, informal care only			Not specified but analysed as part of total costs	**Currency / Price year**: GBP£, 2000-1 **Total costs** (mean per week alive, per person): *Int1*: £607, *Int2*: £641 **Conclusion**: "Overall, the costs of care for those receiving the assessment were no	✓

													greater with NHS costs actually lower. The potential benefits in involving specialist clinicians in the assessment process include identifying previously undiagnosed conditions and enhancing care managers' decision making[; this] could be provided at a modest marginal cost."	
Markle-Reid 2006[10]	hmcr & mfar(w/med+slfm) n = 120/144	hmcr & mfar n = 122/144	Soc (inc. HSCS)	6	●				●	●	● Out of pocket expenses	● Number of days off work	Not specified but analysed as part of total costs	**Currency / Price year**: CAD$ (CAN $1 = USD $0.641, GBP £0.445 and EUR €0.717), (assumed) 2001-2 **Total costs:** No statistically significant difference between the two groups **Conclusion**: "Home based nursing health promotion, proactively provided to frail older people with chronic health needs, enhances quality of life while not increasing the overall costs of health care. The results underscore the need to re-invest in nursing services for health promotion for older clients receiving home care."	✓
Walters 2017[11]	mfar(w/slfm) n = 25/26[f]	ac n = 24/25[g]	HSCS and Soc (inc. HSCS)[h]	6	●				●	●	● Transport, privately paid home help, informal care, benefits received, social outings only		Training costs (staff time on training, oncosts, overheads), staff time on supervision, time on service delivery (appoint-ments, adminis-tration, travelling), consum-ables supplied to clients	**Currency / Price year**: GBP£, 2015-6 **Total costs** (mean per person): (health services only) *Int1*: £1650 (SE £908) (95% CI £-179 to £3478), *Int2*: £2575 (£927) (95% CI £707 to £4445) (care and support services only): *Int1*: £1563, *Int2*: £3632 **Experimental intervention costs** (mean, per person): £307 **Budget impact analysis**: If the NHS was to commission, and assuming delivered by a NHS band 6 staff member, savings are £907 per patient in secondary care and £16 in community care; equal a net saving to a NHS commissioner of £616 per patient, with greater number of patients reducing the per-patient cost. If the local government was to commission, the total cost saving of home-based social care is £170 and a total additional cost of	~

| | | | | | | | | | | | £297 for accommodation; resulting in a total additional cost to local government of £434 per patient.
Conclusion: "The intervention was delivered at modest cost. Although there were promising findings in terms of its potential for cost-effectiveness, this was a small study and it would be premature to recommend more widespread implementation, except as part of a larger-scale evaluation. The budget impact assessment provides preliminary information to Clinical Commissioning Groups and/or local authorities on the potential costs and benefits to their local budget should they wish to implement this service." | |

approx., approximately; CAD$, Canadian dollar; CDI, Community Dependence Index; CE, cost-effectiveness; CEA curve, cost-effectiveness acceptability curve; CI, confidence interval ; CUA, cost-utility analysis; EUR€, Euro; GBP£, British pound; GDP, gross domestic product; GP, general practitioner; HSCS, health and social care system; HKD$, Hong Kong dollar; ICER, incremental cost-effectiveness ratio; n, number of participants analysed out of the number randomised; NICE, National Institute of Health and Clinical Excellence; NOK, Norwegian krone; QALY, quality-adjusted life year; SD, standard deviation; SE, standard error; society including healthcare services; USD$, US dollar; WHO, World Health Organization; WTP, willingness to pay

Intervention and control group abbreviations are a combination of the following:- ac: available care; ADL: activities of daily living training; aids: provision of aids and adaptions; cgn: cognitive training; comm: technology for communication and engagement; educ: health education; eng: engagement in meaningful activities; exrc: physical exercise; hmcr: formal homecare; hmnt: alternative medicine; med: medication review; mfa: multifactorial action; mfar: multifactorial action and follow-on routine review; mntr-mfa: monitoring, which may trigger multifactorial action; ntr: nutritional support; psyc: psychological therapy; rsk-mfa: risk screening, which may trigger multifactorial action; sst: social skills training; vchr: care voucher provision; wlfr: welfare rights advice; w/med: with medication review; w/slfm: with self-management.

a   ● indicates the category was included in the study evaluation

b   ✓ indicates that experimental intervention was clearly concluded as a more cost-effective, lower-cost alternative, or recommended by the study authors; ✗ indicates that experimental intervention was explicitly not recommended by the study authors; ~ indicates that no definite conclusion was drawn by the study authors.

c   Mean difference = Intervention 1 (Int1) group value minus Intervention 2 (Int2) group value

d   Study authors considered the treatment a success if a patient's MOS-20MH score increased by more than 10 points and the GARS-3 score declined no more than 4.5 points.

e   CE plane regions: southeast quadrant represents less costs and more effects (superior), northeast quadrant represents higher costs and more effects, southwest quadrant represents less costs and less effects, northwest quadrant represents higher costs and less effect (inferior)

f   Cost-effectiveness was evaluated with two outcomes which were not of interest of this review: ICER - COPM performance in daily life activities; ICER - COPM satisfaction with performance in daily life activities.

g   Imputation used to replace missing values

h   Two separate perspectives were used in the evaluation.

Table 2: Economic evaluation analysis and principal findings reported for the medium-term time horizon

| Study | Intervention 1 (Int1) (Experimental intervention) | Intervention 2 (Int2) (comparator) | Perspective | Time horizon (months) | Evaluation type[a] | | | Cost items category[a] | | | | Intervention cost items | Currency / Price year / Principal findings / Conclusion of study | Study conclusion[b] |
					Cost analysis	Cost-effectiveness analysis	Cost-utility analysis	Cost-benefit analysis	Health sector costs	Other sector costs	Patient and family costs	Productivity impacts			
Dorresteijn 2016[12]	ADL n = 130/194	ac n = 159/195	Soc (inc. HSCS)	12	●	●[c]	●		●		● (nursing) home-care, formal and informal care, aids, and in-home modifications only		Materials used, salaries of the facilitators, costs of training sessions for the facilitators, etc.	**Currency / Price year**: EUR€, 2011 **Total costs** (mean per person): ***Int1***: €7890 (SD €6450), ***Int2***: €8094 (SD €7466) **ICER** (per QALY): base case: €-9586 (dominant), healthcare perspective: €−14,018 (dominant), per-protocol: €−159,846 (dominant), without outliners: €−35,330 (dominant) **CE plane**: (QALY base case) 57% in southeast, 38% northeast, 1% southwest, 3% northwest quadrants[d]. (Sensitivity analyses) Overall, the probability of the cost-effectiveness of AMB-Home increased if participants received five or more sessions compared to usual care (per-protocol), decreased when costs were taken only from a healthcare perspective, and without outliers was rather similar to the base case analyses. **Conclusion**: "The programme is likely to be cost-effective, and therefore a useful addition to current geriatric care, particularly for those persons who are not able or willing to attend group programmes."	✓

Study	Intervention													Cost components	Results	
Clark 1997[1]	eng & educ n = 51/51	ac n = 112/112		Soc (inc. HSCS)	15	●		●			●		● Paid caregiver only	● Unpaid caregiver only	Int1: Staff time spent on preparation, contacts, and travelling; Int2: Staff time spent on preparation and contacts	**Currency / Price year**: USD$, 1995; annual discount rate of 3% for costs **Total costs** (annualised mean per person): *(15 months, post-treatment) Int1*: $4145 (SD $10,801), *Int2*: $5218 (SD $9588) **Intervention costs** (mean per person): *Int1*: $548, *Int2*: $68 **ICER** (per QALY)**:** $10,666 (95% CI $6,747 to $25,430) **Conclusion**: "Preventive OT demonstrated cost-effectiveness in conjunction with a trend toward decreased medical expenditures." **Notes:** Costs during intervention phase estimated at 9 months	✓
Cameron 2013[13]	exrc & mfar(w/med+slfm) n = 119/120	ac n = 119/121		HSCS	12	●	●[e]	●	●[e]		●		● Also transport		Staff time spent on assessments and intervention delivery, materials and equipment in intervention delivery, aids and adaptions	**Currency / Price year**: AUD$, 2011 **Total costs** (mean per person): *Int1* $25,030 (SD $29,827), *Int2* $22,885 (SD $32354); *mean difference[f]*: $2145 (95% CI $-5698 to $10,221) **Experimental intervention costs** (mean per person): $1528.52 **ICER:** (per QALY) taking uncertainty into account, the bootstrapped replicates indicated that 10.8% probability of being cost saving across the entire participant population, 17.8% probability of saving in the very frail subgroup, and 8.2% probability in the frail subgroup **Conclusion**: "For frail older people residing in the community, a 12-month multifactorial intervention provided good value for money, particularly for the very frail, where it has a high probability of being cost saving as well as effective."[e]	✓[e]
Brettschneider 2015[14]	mfar(w/med) n =	ac n =		Soc (inc. HSCS)	18	●		●	●		● Also medical devices, dentures	●	● Informal care, transport, in-home		Staff training cost, staff time spent on assessments,	**Currency / Price year**: EUR€, 2008; reported no discounting **Total costs** (mean per person): *Int1*: €20,195 (SD €21,689), *Int2*: €21,028 (SD	X

Study															
	133/150	145/155									modifications only		case conferences and home visits, participant's travel costs	€24,384); **adjusted mean difference[f]**: €4400.52 (SE €3019.61) **Experimental intervention costs** (mean per person): €73 (SD €22) **CEA curve**: 15% probability of an ICER <€50,000/QALY for preventive home visits. At a WTP of €0/QALY the probability of cost-effectiveness of preventive home visits was 7%, while at a WTP of €250,000/QALY the probability was 39%. **Conclusions**: "The evaluated preventive home visits programme is unlikely to be cost-effective."	
Hogg 2009[15]	mfar(w/med) n = 74/120	ac n = 78/121	HSCS[g]	15	●	●[h]		●		● Also personal service support			Staff time spent on intervention delivery and adminis-tration, medical supplies, overheads	**Currency / Price year**: CAD$, (assumed) 2004-6 **Total costs** (mean, per person): **Int1**: $12,923, **Int2**: $9222; **mean difference[f]**: $3701 (95% CI $385 to $7024) **Experimental intervention costs** (mean, per person): $3802 **Conclusion**: "By any of the metrics used, the APTCare intervention was not cost-effective, at least not in a population for which baseline quality of care was high."	X
Suijker 2016[16]	mfar(w/med) n = 1209/1209[i]	ac n = 1074/1074	HSCS	12	●	●	●		●		●		Staff time spent on training, postal screening, visits, and planning treatment plans	**Currency / Price year**: EUR€, 2010 prices adjusted for 2016 **Total costs** (mean per person): **Int1**: €6518 (SE €472), **Int2**: €5214 (SE €338); **mean difference[f]**: €1457 (95% CI €572 to €2537) **Experimental intervention costs** (mean per person): €168 **ICERs**: (per 1 point of modified Katz-ADL index) €21,884 (per QALY) €287,879 **CE plane**: 79% of the modified Katz-ADL cost-effect pairs and majority of the QALY cost-effect pairs in the northeast	X

| | | | | | | | | | | | | | quadrant[d] **CEA curve**: maximum probability of the intervention being cost-effective was 14% at a WTP of €50,000 per one point improvement on the modified Katz-ADL index score, and 4% at a WTP of €50,000/QALY gained; less than 1% probability of cost-effectiveness at a WTP of €0 per modified Katz-ADL point or QALY. **Conclusion**: "The current intervention was not cost-effective compared to usual care to prevent or postpone new disabilities over a one-year period. Based on these findings, implementation of the evaluated multifactorial nurse-led care model is not to be recommended." | |
| Gitlin 2006[17] | ADL & aids & exrc n = 160/160 | ac n = 159/159 | HSCS[j] | 12 | ● | ● | | ● | | | ● Experimental intervention costs only | | | Staff time spent on training and with participants, materials, travel mileage, home modifications | **Currency / Price year**: USD$, 2003 (adjusted to 2010 values); reported not discounted; Model 1 (base case) reports on estimated costs of delivering ABLE in a home care agency. Model 2 (base case + 10%) accounts for a potential variation in the cost of delivering ABLE in a real world setting. **Experimental intervention costs** (mean per person): *base case*: $942, *base case + 10% model*: $1036 **ICER** (cost per one additional year of life): *base case model*: $13,179, *base case +10% model*: $14,800 **CEA curve**: Probability of the intervention being cost-effective is greater than 50% of the time as long as a purchaser is willing to pay more than $13,000 for one additional year of life under the base case model; or $14,800 under the base case +10% model. **Conclusion**: "This economic evaluation | ~ |

													suggests that investment in this program may be worthwhile depending on one's willingness to pay. However, confidence intervals varied widely due to small effect in reducing mortality."	
Kukkonen-Harjula 2017[18]	ADL & ntr & exrc n = 150/150	ac n = 149/149	HSCS	12	●		●		●		●			Physio-therapist visits	**Currency / Price year**: EUR€, 2018 (service costs valued at 2011 and corrected for inflation) **Total costs** (mean, pyrs): *(12-month intervention period) Int1*: €33,839 (SE €2167), *Int2*: €21,151 (SE €2185); *mean ratio*: 1.60 (95% CI 1.23 to 1.98) **CE plane**: For the first 12 months, for costs and QALYs, all participants lay in the northeast quadrant[b], implying that the intervention was more effective but more costly than usual care. **Conclusion**: "The exercise investment was costly, but the costs were gained back in decreased utilization of health care and social services in the exercise frail subgroup over 24 months."	~
Blom 2016[19]	mfa-(w/med +slfm) n = 288/288[i]	ac n = 1091/1091[i]	Soc (inc. HCS)	12	●		●		●		●		● Informal care only	Staff training costs (course development, materials, time), staff time spent on assessments and formulating care plans, materials, participants' time invested in the intervention	**Currency / Price year**: EUR€, 2013; reported no discounting **Total costs** (mean per person): *Int1*: €18761, *Int2*: €20066; *mean difference*[f]: €-1305 (95% CI €-16,349 to €13,744) **Experimental intervention costs**: €236-370 per care plan (mean cost for a GP practice conducting 25 or 10 plans respectively, cost is lower for more plans in a practice). **For reasonable WTP**: values above €10,000 per QALY, both policies are about 50% likely to be preferred. **Conclusion**: "The care plan costs were low compared to (the variability of) the total costs during the 1-year follow-up period,	~

													and were not significantly different between groups. Due to the uncertainty in WTP, the economic preference for care is undecided."	
Parsons M 2017[20]	hmcr & ADL & mfar(w/slf m) n = 15/56	hmcr & mfa- n = 12/57	HSCS	12	●	●		●		●	●	Also social worker, volunteer services, modifications, transport, carer support	Costs to the older people (items not specified)		Not specified but analysed as part of total costs	**Currency / Price year**: NZD$ 2006 **Total costs** (mean per person): **Int1**: $46,256, **Int2**: $32,413 *mean difference*[f]: $13,842.66 **ICERs** (mean per person): (each day residential care avoided): $880.57 (each day deceased avoided): $392.27 (each day in community gained): $271.26 **Sensitivity analysis**: Results can be quite sensitive to changes in the average resource use and changes in living and survival status outcomes. **Conclusion**: "While the cost of the initiative was more than the cost for usual care, the initiative had the result of increasing the amount of time spent in the community relative to usual care over a 12-month period, by decreasing the time spent in residential care and the time spent deceased. "Community FIRST may appear much more expensive for the outcome it achieves (among the three initiatives as part of the ASPIRE project), but this is because it faced greater challenges with its sampled participants."	~
Parsons M 2012[21]	hmcr & mfar n = 116/169	hmcr & mfa- n = 117/182	HSCS	12	●	●		●		●	●	Also social worker, volunteer services, modifications, transport, carer support	Costs to the older people (items not specified)		Not specified but analysed as part of total costs	**Currency / Price year**: NZD$, 2006 **Total costs** (mean per person): **Int1**: $13,936, **Int2**: $13,779; *mean differenc*[f]: $157.49 **ICERs** (mean per person): (each day residential care avoided): $22.84 (each day deceased avoided): $190.74 (each day in community gained): $20.13	~

															Sensitivity analysis: Results can be quite sensitive to changes in the average resource use and changes in living and survival status outcomes. **Conclusion**: Over 12 months, "the cost of the initiative was more than the cost for usual care, [but it increased time remaining at home comparatively], by [reducing] time spent in residential care [or] deceased." "Our base case results suggest that COSE costs an additional $20 per person over a 12-month period for each extra day spent in the community relative to usual care."	
Leveille 1998[22]	educ & exrc & mfar(w/med+slfm) n = 100/101	ac n = 100/100	HSCS	12	●				● Hospital in-patient charges only	● Experimental intervention costs only			Salaries of intervention team	**Currency / Price year** (assumed): USD$, mid-1990s **Hospital charges** (mean per person): *mean difference*[f]: savings of approx. $1200 in Int1 **Experimental intervention costs** (mean per person annually): approx. £300 **Conclusion**: "The estimated cost savings, based on the absolute reduction in the number of inpatient days by intervention participants, were substantial. […] These findings in regard to inpatient costs alone are very encouraging and suggest a sizeable cost benefit to healthcare insurers from this approach to disability prevention."	✓

Bleijenberg el al. 2016[23]	UPRIM screening rsk-mfa- n = 790/790 UPRIM+U-CARE rsk-mfa- n = 1446/1446	ac n = 856/856	HSCS	12	●					● Items not specified					Not specified but analysed as part of total costs	**Currency / Price year**: EUR€, (around) 2010-2 **Total costs** (mean per person): *Int1: (U-PRIM)* €6651, (***U-PRIM+U-CARE***) €6825, *Int2*: €7601. **Conclusions**: "U-PRIM and U-PRIM+U-CARE resulted in better preservation of daily functioning in older patients and has a high probability of being cost-effective compared with usual care."	✓
Mann WC 1999[24]	hmcr & aids n = 52/52	hmcr n = 49/52	HSCS	18	●					●	● Also case manager visits				AT and EI only	**Currency / Price year**: (assumed) USD$, mid-1990s **Total costs** (mean per person): *Int1*: $14,172 (SD $13,761), *Int2*: $31,610 (SD $42,239) **Intervention costs on AT-EIs** (mean per person): *Int1*: $2620, *Int2*: $443 **Conclusion**: "The frail elderly persons in this trial experienced functional decline over time. Results indicate rate of decline can be slowed, and institutional and certain in-home personnel costs reduced through a systematic approach to providing AT and EIs."	✓
Bernabei 1998[25]	hmcr & mfar(w/med) n = 99/100	hmcr n = 100/100	HSCS	12	●					●	●				Salaries of intervention team	**Currency / Price year**: GBP£ and USD$, (assumed) 1995 **Total costs**: savings of £1125 ($1800) per year of follow up in Int1, 23% less than Int2, mainly from reductions in nursing home and hospital expenses **Conclusion**: "Integrated social and medical care with case management programmes may provide a cost-effective approach to reduce admission to institutions and functional decline in older people living in the community."	✓

Study	Intervention	Comparator	Perspective	Time	●					●		●			Out-of-pocket	Loss of income	Other costs	Results	
Ploeg 2010[26]	educ & mfar(w/med) n = 350/361	ac n = 343/358	HSCS	12	●					●		●					Not specified but analysed as part of total costs	**Currency / Price year**: CAD$, (assumed 2004-6) **Total costs** (mean per person): *Int1*: $7779 (SD $7980), *Int2*: $8096 (SD $9582); *mean difference[f]*: $-165 (£107; €118; USD$162) (95% CI $-16545 to $16214) **Conclusion**: "A preventive primary care outreach intervention for older Canadian adults at risk of functional decline had no effect on QALYs, costs of health and social services, functional status, self-rated health, or mortality. "The results of this study do not support adoption of this preventive primary care intervention for this target population of high-risk older adults."	X
Hay 1998[27]	mfa- n = 75/209	Usual care (CG1: no baseline; CG2: assessed at baseline) CG1: ac CG2: ac CG1 n = 103/207 CG2 n = 86/203	Soc (inc. HSCS)	12	●					●		●		Out-of-pocket expenses only ●	Loss of income or work days only ●		Not specified, not included in total costs analysis.	**Currency / Price year** (assumed): CAD$, 1991-5 **Total costs** (mean per person annually): *(during treatment) Int1*: $4001, *CG1*: $1555, *CG2*: $2587 **Conclusion**: "While the study provided an opportunity for these interventions, there was no demonstrable benefit in terms of cost or health status. There were no significant differences in health system use costs, although the experimental group showed higher use the year they were being treated and a marked decrease in the second year. Differences in hospitalization rates account for this variation."	X
Counsell 2007[28]	educ & mfar(w/med+slfm)	ac n =	HSCS	12	●					●							Salaries and benefits for personnel, mileage	**Currency / Price year**: USD$, (assumed 2002-4) **Total costs** (mean per person): *(12 months) Int1*: $7917 (SD $10,457),	~

	n = 474/474	477/477										reimburse-ment, pager and cellphone costs, home visit bags, and office supplies	**Int2**: $6163 (SD $10,044) **Experimental intervention costs** (mean per person annually): **all**: $1260, **high risk**: $1432, **low risk**: $1207 **Conclusion**: "In patients at high risk of hospitalization, the GRACE intervention is cost neutral from the healthcare delivery system perspective. A cost-effectiveness analysis is needed to guide decisions about implementation in low-risk patients."	
Newcomer 2004[29]	educ & mfar(w/med) n = 1523/1537	ac n = 1532/1542	HSCS[k]	12	●			● Hospital in-patient charges only				Not specified	**Currency / Price year** (assumed): USD$, 2001-3 **Hospital charges** (mean per person monthly): **Int1**: $2002 (SD $9895), **Int2**: $2102 (SD $15,227); **mean change**[e] (increase from baseline): **Int1**: $1110 (SD $10,300), **Int2**: $1071 (SD $15,597). **Conclusion**: "Regardless of the approach taken to quantify or standardize service use or expenditures, the unadjusted findings were consistent: There was no statistically significant treatment effect evident among the study outcomes."	~

approx., approximately; AT and EI, assistive technology and home environmental interventions; CAD$, Canadian dollar; CE, cost-effectiveness; CEA curve, cost-effectiveness acceptability curve; CI , confidence interval; EUR€, Euro; GBP£, British pound; HSCS, health and social care system; ICER, incremental cost-effectiveness ratio; n= number of participants analysed out of the number randomised; NZD$, New Zealand dollar; pyrs, per person-years; QALY, quality-adjusted life year; SD, standard deviation; SE, standard error; Soc (inc. HSCS), societal perspective including health and social care system; USD$, US dollar; WTP, willingness to pay

Intervention and control group abbreviations are a combination of the following:- ac: available care; ADL: activities of daily living training; aids: provision of aids and adaptions; cgn: cognitive training; comm: technology for communication and engagement; educ: health education; eng: engagement in meaningful activities; exrc: physical exercise; hmcr: formal homecare; hmnt: alternative medicine; med: medication review; mfa: multifactorial action; mfar: multifactorial action and follow-on routine review; mntr-mfa: monitoring, which may trigger multifactorial action; ntr: nutritional support; psyc: psychological therapy; rsk-mfa: risk screening, which may trigger multifactorial action; sst: social skills training; vchr: care voucher provision; wlfr: welfare rights advice; w/med: with medication review; w/slfm: with self-management.

a   ● indicates the category was included in the study evaluation

b   ✓ indicates that experimental intervention was clearly concluded as a more cost-effective, lower-cost alternative, or recommended by the study authors; ✗ indicates that experimental intervention was explicitly not recommended by the study authors; ~ indicates that no definite conclusion was drawn by the study authors.

c   Cost-effectiveness was evaluated with Falls Efficacy Scale-International (FES-I) which is not an outcome of interest.

d   CE plane regions: southeast quadrant represents less costs and more effects (superior), northeast quadrant represents higher costs and more effects, southwest quadrant represents less costs and less effects, northwest quadrant represents higher costs and less effect (inferior)

e   Cost-effectiveness was evaluated with extra number of patients experiencing transition out of frailty which is not an outcome of interest.

f   Mean difference = Intervention 1 (Int1) group value minus Intervention 2 (Int2) group value

g   Specific payer's perspective mentioned: From the perspective the provincial Ministry of Health

h   Cost-effectiveness was evaluated with quality of care which is not an outcome of interest.

i   Imputation used to replace missing values

j   Specific payer's perspective mentioned: From the perspective of a homecare agency

k   Specific payer's perspective mentioned: From the perspective of Medicare, USA

Table 3. Economic evaluation analysis and principal findings reported for the long-term time horizon

Study	Intervention 1 (Int1) (Experimental intervention)	Intervention 2 (Int2) (comparator)	Perspective	Time horizon (months)	Evaluation type[a]				Cost items category[a]				Intervention cost item	Currency / Price year / Principal findings / Conclusion of study	Study conclusion[b]
					Cost analysis	Cost-effectiveness analysis	Cost-utility analysis	Cost-benefit analysis	Health sector costs	Other sector costs	Patient and family costs	Productivity impacts			
Liimatta 2019[30]	exrc & mfa-(w/med) n = 211/211[c]	ac n = 211/211[c]	HSCS	24	●		●		●	●			Unit costs of home visits	**Currency / Price year**: EUR€, 2013-2014 (service costs valued at 2011 and corrected for inflation) **Total costs** (mean, pyrs): *Int1*: €7310 (SE €849), *Int2*: €8277 (SE €1089); *mean difference*[d]: €-967 (95% CI €-3766 to €1633); *mean ratio*: 0.84 (95% CI 0.55 to 1.13) **Experimental intervention costs** (mean, per person): €382 **CE plane**: 60% ICERs per QALY lie in the dominant (southeast) quadrant[e] **Conclusion**: "The intervention appeared to have positive effects on health-related quality of life without accruing additional costs."	✓
Metzelthin 2013[31]	educ & mfar(w/med+slfm) n = 103/193	ac n = 91/153	Soc (inc. HSCS)	24	●	●	●		●	●	● Informal care, aids and in-home modifications only		Intervention materials, training activities, postal screening, and staff time spent on home visit assessments, treatment plans, delivering interventions	**Currency / Price year**: EUR€, 2010 **Total costs** (mean per person): *Int1*: €26503 (SD €27273), *Int2*: €20,550 (SD €18891); *mean difference*[d]: €5953 (95% CI €-633 to €12538) **Experimental intervention costs** (mean per person): €728 **ICERs** (per GARS score): €1920, (per QALY UK tariff): €150616, without	✗

														intervention costs: €132195, QALY Dutch tariff: €285428 **CE plane**: (QALY UK tariff) 2% in southeast, 19% northeast, 2% southwest, 77% northwest quadrants[e]. (GARS): 1% in southeast, 2% northeast, 3% southwest, 95% northwest quadrants[e]. **Sensitivity analyses:** did not reveal other results **Conclusion**: "The intervention under study led to an increase in healthcare utilisation and related costs without providing any beneficial effects. This study adds to the scarce amount of evidence regarding cost-effectiveness of proactive primary care in community-dwelling frail older people."	
Bouman 2008[32]	mfar(w/med) n =139/160 (analysed for CE; 160 analysed for costs)	ac n =154/170 (analysed for CE; 170 analysed for costs)	HSCS	24	●	●			●	● Also aids, in-home modifications			Staff salaries, staff travel costs, staff training activities	**Currency / Price year**: EUR€, base year 2003, or otherwise discounted at 4% **Total cost** (mean per person): *Int1*: €15679, *Int2*: €15229; *mean difference*[d]: €450 (95% CI €-3780 to €4680) **Experimental intervention costs** (mean per person): €753 **ICER** (per self-rated health score): bootstrap analysis showed a 10% chance that the intervention was cost-effective **Conclusion:** "The home visiting program did not appear to have any effect on the health care use of older people with poor health and had a low chance of being cost-effective. [… T]hese visits are probably not beneficial for such persons [in this] or comparable settings …"	X
Howel 2019[33]	wlfr n =	ac n =	HSCS	24	●		●	●		● Welfare rights advice services			Time spent on home visit, telephone calls,	**Currency / Price year**: GBP£, 2013-4 discounted at 1.5% for second year **Experimental intervention costs** (mean	X

Study	Int	Comp	Persp	Mo									Cost items	Results	
	381/381	374/374								only			letter/email writing, administration, and travel costs	per person): £43.76; 38% were travel costs **ICER** (per QALY): £1914 **CEA curve**: 63% probability that the intervention would be cost-effective, should society be willing to pay £20000/QALY gained. These results were robust to changes in the discount rate and higher costs associated with the delivery of the intervention. **Conclusion**: "We found no effects on health outcomes; fewer participants than anticipated received additional benefit entitlements, and participants were more affluent than expected. Our findings do not support delivery of domiciliary welfare rights advice to achieve the health outcomes assessed in this population. However, better intervention targeting may reveal worthwhile health impacts."	
Kukkonen-Harjula 2017[18]	ADL & ntr & exrc n = 150/150	ac n = 149/149	HSCS	24	●		●		●	●			Physio-therapist visits (specific cost items not provided)	**Currency / Price year**: EUR€, 2018 (service costs valued at 2011 and corrected for inflation) **Total costs** (mean, pyrs): *(0-24 months including post-intervention) Int1*: €23961 (SE €2198), *Int2*: € 29428 (SE €2282); *mean ratio*: 1.23 (95% CI 0.95 to 1.50) **Conclusion**: "The exercise investment was costly, but the costs were gained back in decreased utilization of health care and social services in the exercise frail subgroup over 24 months."	~
Vass 2005[34]	mfar(w/med) n = 2092/2104	mfar n = 1942/1956[c]	HSCS	36	●	●		●	● Included all resources used recorded in routine healthcare	● Included all resources used recorded in routine social services databases	● Patient co-payments for care and prescription only		Staff training programme, GP services, staff time on home visits, transport, administration,	**Currency / Price year**: EUR€ (€1=7.46 Danish crowns), 2001-2002 prices converted to 2005 values; reported as undiscounted, and in present values using a 3% and 6% discount rate a year. **Total costs** (mean per person):	~

[c]									databases, which include dental care, aids and applications				breaks, meetings.	(75-year-old) *Int1*: €12899 (SE €605.36), *Int2*: €13778 (SE €587.94); *mean difference*[d]: €-879 (95% CI €−2534 to €776); discounted 3%: €-855 (95% CI €-2455 to €744) (80-year-old) *Int1*: €17773 (SE €1332.17), *Int2*: €17059 (SE €1180.97); *mean difference*[d]: €714 (95% CI €−2779 to 4207); discounted 3%: €694 (95% CI €−2684 to 4071) **ICERs** (per active life-year): (75-year-old) mean total costs were the same in the groups as well as the mean number of active life-years. Thus it was not relevant to calculate ICERs. (80-year-old, costs and active life-years discounted 3%) €3522 per active life year gained; **Sensitivity analyses**: €2906 to €6294 per active life-year gained among the 80-year-olds **WTP**: Probability that Int1 intervention being more cost effective than Int2: (75-year-old) did not increase 86% for ceiling ratios up to €60000 per active life-year gained. (80-year-old) increased to 93% if a decision maker is willing to pay at least €20000 per active life-year gained, and to 98% if they are willing to pay at least €27000 per active life-year gained. **Conclusion**: "Neither the differences in the total costs nor […] the effectiveness measure were statistically significant. The estimates […] fell into a range where no definite conclusions can be drawn regarding cost-effectiveness. [It] depends on the decision makers' […] willingness to pay for an active life-year in elderly persons."	

Study	Intervention	Comparator	Perspective	Time											Notes	Results	
Lewin 2013[35]	hmcr & educ & mfar n = 375/375	hmcr n = 375/375	HSCS	24	●					●		●			Not specified but analysed as part of total costs	**Currency / Price year**: AUD$, (assumed) 2007-8 **Total costs** (mean per person): *Int1*: $19888, *Int2*: $22757 **Conclusion**: "Given the projected increase in numbers of older people in Australia over the next 40 years, the incorporation of intensive restorative services into the Gateway proposed for the reformed Australian aged care system (Commonwealth of Australia 2012) could result in very substantial savings at a whole of population level. Careful targeting of older people to maximise the cost-effectiveness of restorative interventions warrants further investigation."	✓
Hay 1998[27]	mfa- n = 75/209	Usual care (CG1: no baseline; CG2: assessed at baseline) CG1: ac CG2: ac CG1 n = 103/207 CG2 n = 86/203	Soc (inc. HSCS)	24	●					●		●		● Out-of-pocket expenses only	● Loss of income or work days only	Not specified, not included in total costs analysis.	**Currency / Price year** (assumed): CAD$, 1991-5 **Total costs** (mean per person annually): *(post-treatment) Int1*: $1600, *CG1*: $1041, *CG2*: $2458 **Conclusion**: "While the study provided an opportunity for these interventions, there was no demonstrable benefit in terms of cost or health status. There were no significant differences in health system use costs, although the experimental group showed higher use the year they were being treated and a marked decrease in the second year. Differences in hospitalization rates account for this variation."	✗

van Rossum 1993[36]	mfar n = 292/292	ac n = 288/288	HSCS	36	●				●		●			Staff time spent on home visits, travelling, preparing the visits, administration	**Currency / Price year**: NLG*f* (*f*1 = approx. GBP£0.29 and USD$0.51), (assumed) 1988-92 **Total costs** (mean per person): *Int1*: *f*20080, **Int2**: *f*19321; ***mean difference*[c]**: +4% **Experimental intervention costs** (total): *f*393981 **Conclusion**: "From a financial point of view, the visits were not beneficial: apart from the reduced hospital costs, the 'gains' in favour of the intervention group were only marginal (home nursing care and nursing home). The increased costs in the intervention group with respect to most community services and homes for the elderly balanced the reduction of hospital costs. Preventive home visits are not beneficial for the general population of elderly people living at home but might be effective when restricted to subjects with poor health."	χ
Counsell 2007[28]	educ & mfar(w/m ed+slfm) n = 436/474	ac n = 440/477	HSCS	24 & 36	●				●					Salaries and benefits for personnel, mileage reimburse-ment, pager and cellphone costs, home visit bags, and office supplies	**Currency / Price year**: USD$, (assumed 2002-4) **Total costs** (mean per person): *(24 months, cumulated) Int1*: $14348 (SD $15008), high risk: $17713 (SD $16776), low risk: $13307 (SD $14286), *Int2*: $11834 (SD $15567), high risk: $18776 (SD $19472), low risk: $9654 (SD $13429) *(24-36 months, post-intervention) Int1*: $5045 (SD $9684), high risk: $5088 (SD $7481), low risk: $5032 (SD $10258), *Int2*: $4732 (SD $10012), high risk: $6575 (SD $9030), low risk: $4217 (SD $10222) **Conclusion**: "In patients at high risk of hospitalization, the GRACE intervention is cost neutral from the healthcare	~

															delivery system perspective. A cost-effectiveness analysis is needed to guide decisions about implementation in low-risk patients."	
Coleman 1999[37]	educ & mfar(w/med+slfm) n = 96/96	ac n = 73/73	HSCS	24	●				●					Not specified but analysed as part of total costs	**Currency / Price year** (assumed): USD$, mid-1990s **Total costs** (mean per person annually): *Int1*: $9535, *Int2*: $10116 **Conclusion**: "Costs of medical care including frequency of hospitalization, hospital days, emergency and ambulatory visits, and total costs of care were not significantly different between intervention and control groups."	~

| Stuck 2000[38] | mfar(w/med)

n = 775/791 from both groups | ac | HSCS | 36 | ● | | | | ● | ● | | | In-Home visits | **Currency / Price year**: SFr (SFr 1 = approx. USD$0.60), 1995
Total costs (per person annually):
mean difference: SFr 1500 (USD$900) more in Int1 than Int2
Subgroup analysis: Despite the similar health status of subjects, fewer health problems in Int1 participants were identified by 1 (nurse c) of 3 nurses. Among low-risk subjects visited by the 2 nurses (ZIP codes A & B), the PHVs resulted in net cost savings in the third year (SFr 2336 (USD$1403) per person per year), but not among those visited by nurse C.
Experimental intervention costs (mean per person): SFr 460 (USD$276)
Conclusion: "In the subgroup with favourable outcomes (i.e., among low-risk subjects in ZIP codes A and B), [… t]he program resulted in additional costs [near the start] of the intervention, but in the third year, the additional […] costs […] were more than offset by savings in nursing home costs…" | ~ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kono 2012[39] | mfar

n = 161/161 | mfar

n = 162/162 | HSCS | 24 | ● | | | | ● | ● Also visiting nursing care, aids and home modifications | | | Preventive home visits (specific cost items not provided) | **Currency / Price year**: JP¥ (1 USD$ = ¥104.5 in 2008, = ¥94.6 in 2009)
Total costs: (mean per person):
Int1: ¥2016606 (SE ¥161432; approx. USD$20166, SE $1,614), *Int2*: ¥2287450 (SE ¥200535; approx. USD$22875, SE $2005)
Experimental intervention costs (mean per person per year): ¥5000 (approx. USD$50) | ~ |

					●									**Conclusion**: "The total LTC costs over 2 years in the intervention group were higher than in the control group (non-significant), and the intervention group utilised significantly more community and institutional LTC services than the control group over the period 7 months to 15 months after the intervention started. "The present second analysis of randomized controlled trial showed that a preventive home visit program can reduce health care costs, primarily from reduced hospitalizations, in addition to providing other major benefits. "The results suggest that a preventive home visit program might be ineffective on functional and psychosocial status among ambulatory frail elders overall, although it might significantly improve ADLs, IADLs and depression for those with ADL dependency."	
Kono 2016[40]	mfar(w/med) n = 149/179	mfar n = 157/181	HSCS	36	●					● Also visiting nursing care			Not specified but analysed as part of total costs	**Currency / Price year**: credit (1 credit = JP¥ 10.0 - 10.70 at 2014) **Total costs** (mean per person): *Int1*: 3507 (SD 5400) credits, *Int2*: 3562 (SD 5066) credits **Conclusion**: "No statistically significant differences in total LTC service costs per person over 36 months between groups were obtained. "We conclude that our PHV program with rigorous recommendations, based on the systematic structured assessment of care-needs, could be beneficially applied in clinical practice for the prevention of functional decline among ambulatory frail elderly people living at home."	~

approx., approximately; CAD$, Canadian dollar; CE, cost-effectiveness; CEA curve, cost-effectiveness acceptability curve; CI, confidence interval; CUA, cost-utility analysis; EUR€, Euro; GBP£, British pound; GP, general practitioner; HSCS, health and social care system; ICER, incremental cost-effectiveness ratio; n, number of participants analysed out of the number randomised; JP¥, Japanese yen; LTC, long-term Care; PHV, preventive home visit; pyrs, per person-years; QALY, quality-adjusted life year; SD, standard deviation; SE, standard error; SFr, Swiss francs; Soc, societal/ society; Soc (inc. HSCS), societal perspective including health and social care system; USD$, US dollar; WTP, willingness to pay

Intervention and control group abbreviations are a combination of the following:- ac: available care; ADL: activities of daily living training; aids: provision of aids and adaptions; cgn: cognitive training; comm: technology for communication and engagement; educ: health education; eng: engagement in meaningful activities; exrc: physical exercise; hmcr: formal homecare; hmnt: alternative medicine; med: medication review; mfa: multifactorial action; mfar: multifactorial action and follow-on routine review; mntr-mfa: monitoring, which may trigger multifactorial action; ntr: nutritional support; psyc: psychological therapy; rsk-mfa: risk screening, which may trigger multifactorial action; sst: social skills training; vchr: care voucher provision; wlfr: welfare rights advice; w/med: with medication review; w/slfm: with self-management.

a   ● indicates the category was included in the study evaluation

b   ✓ indicates that experimental intervention was clearly concluded as a more cost-effective, lower-cost alternative, or recommended by the study authors; ✗ indicates that experimental intervention was explicitly not recommended by the study authors; ~ indicates that no definite conclusion was drawn by the study authors.

c   Imputation used to replace missing values

d   Mean difference = Intervention 1 (Int1) group value minus Intervention 2 (Int2) group value

e   CE plane regions: southeast quadrant represents less costs and more effects (superior), northeast quadrant represents higher costs and more effects, southwest quadrant represents less costs and less effects, northwest quadrant represents higher costs and less effect (inferior)

Community-based complex interventions to sustain independence in older people, stratified by frailty:
a systematic review and network meta-analysis (NIHR128862; CRD42019162195)
Supplementary material 11. Health economic evaluations and results

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