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Quality and cost-effectiveness in long-term care and dependency prevention

THEMATIC REPORT: 2

Prevention of disability

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THEMATIC REPORT: PREVENTION OF DISABILITY

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CONTENTS

Executive Summary

Introduction

This report presents and discusses evidence from several European countries on measures to prevent or delay onset of disability in old age. It considers measures to reduce the disabling impact of chronic health conditions rather than measures to prevent such conditions. The report focuses on prevention of social isolation and loneliness, reablement services and prevention of falls. It places emphasis on measures that enable disabled older people to remain in the community and avoid or delay admission to residential care.

A rapid review of the literature was conducted and a review was made of the country reports prepared by the Network on recent developments on long-term care quality in European countries.

Main findings

Knowledge of what works and for whom in the field of prevention of disability is underdeveloped and fragmented. Studies often highlight the complexity of preventative interventions and the challenges of evaluating them. These include lack of a shared understanding of what prevention comprises, use of various interventions simultaneously, multidimensionality of the outcomes of preventative measures, the long time periods required to assess outcomes and the difficulty of obtaining data to assess what would have happened in the absence of the preventative interventions. Demonstrating a causal relationship between preventative interventions and outcomes is difficult, since a range of factors and practices can interact to produce an outcome.

The evidence on effectiveness and cost-effectiveness of preventative measures is concentrated on the areas of reablement, falls prevention and various community interventions. The majority of studies present evidence from the US, Canada, New Zealand, Australia or western European countries.

The literature highlights the link between social isolation and loneliness and poor outcomes related to reduced quality of life, cognitive impairment, disability, reduced wellbeing and loss of independence, which can lead to an increased use of services and increased mortality. Preventative services should therefore aim to reduce social isolation and loneliness and promote social inclusion. There is some evidence that interventions can improve psychological and physical wellbeing. A systematic review by Dickens et al. (2011) which included 32 studies noted that, across social, mental and physical health, 79% of group-based interventions and 55% of one-to-one interventions reported at least one improved participant outcome.

A recent systematic review by Gardiner, Geldhenuys and Gott (2018) identified six categories of intervention: social facilitation interventions, psychological therapies, health and social care provision, animal interventions, befriending interventions, and leisure/skill development. The review concluded that the majority of interventions reported some success in reducing social isolation and loneliness, but the quality of evidence was generally weak. They found that the factors associated with the most effective interventions included adaptability, a community development approach, and productive engagement.

There is some evidence from a systematic review by Whitehead et al. (2015) that interventions aiming to improve ability to perform activities of daily living (ADLs) independently are effective for a population of homecare service users, in comparison to standard homecare services in which assistance is provided with personal care tasks. A review by Cochrane et al. (2016) included only two studies comparing reablement with usual homecare services and both were assessed as of very low quality. The review by Crocker et al. (2013) of rehabilitation interventions directed at maintaining or improving the physical function of older people in long-term care concluded that physical rehabilitation

at the end of the intervention resulted in improved ADLs, functional independence and mobility.

There is some (mixed) evidence on measures to reduce the rate of falls and/or risk of falling. A Cochrane review found that multiple-component group exercise significantly reduced the rate of falls (16 RCTs) and the risk of falling (22 RCTs), as did multiple-component home-based exercise (seven RCTs). Overall, exercise interventions significantly reduced the risk of sustaining a fall-related fracture (six RCTs). Three studies demonstrated potential for cost savings from delivering the intervention to particular subgroups of older people at high risk of falling. The interventions included: home-based physical exercise in over 80-year-olds (linked to fewer hospital admissions), home safety programmes delivered to individuals with a previous fall, and multifactorial programmes for individuals with four or more of the eight targeted risk factors (Gillespie et al., 2012).

A Cochrane review of falls prevention for older people in care facilities and hospitals noted that the results from 13 RCTs evaluating exercise interventions were inconsistent, but that overall there was no difference between intervention and control groups in the rate of falls (eight RCTs) or risk of falling (eight RCTs) (Cameron et al., 2012). A systematic review of falls prevention among older people with mental health problems (mostly in care homes) found inconsistent evidence. Eight of 14 studies found a reduction in fallers and nine reported a significant reduction in rate or number of falls, but four found an increase in falls. The authors concluded that multifactorial, multidisciplinary interventions and schemes involving exercise, medication review and increasing staff awareness appear to reduce the risk of falls (Bunn et al., 2014). A review of 22 fall prevention studies confirmed evidence on the cost-effectiveness of diverse versions of exercise/physical activity programmes in fall prevention. The review noted that the same intervention might be assessed as cost-effective or not cost-effective depending on the way it was delivered and/or the economic evaluation method used. Moreover, the authors noted that the comparability of results is very limited due to differences in methods as well as in overall quality of the studies (Dubas-Jakobczyk et al., 2017).

Conclusions

Demand for long-term care services for older people is projected to increase which, will place increased upward pressure on public and private expenditure on long-term care. To address this challenge it is very important that evidence-based measures be implemented to prevent or delay onset of disability in old age. It is also very important for the quality of life of older people and their families that the period in which they experience disability reduces rather than rises as life expectancy increases.

Despite a common belief that a more preventative approach will improve the effectiveness and cost-effectiveness of long-term care systems, reviews highlight the limitations of the available research and inconclusive nature of its findings. They highlight in particular the lack of economic analysis of the cost-effectiveness of prevention programmes. More high-quality evaluations are needed.

Introduction

Demand for long-term care services for older people is projected to increase due to a combination of improved mortality rates in later life and baby boomer cohorts reaching old age. This will place increased pressure on public and private expenditure on long-term care (European Commission, 2018). To address this challenge, it is very important that evidence-based measures be implemented to prevent or delay onset of disability in old age. Moreover, it is also very important for the quality of life of older people and their families that the period in which they require long-term care due to disability reduces rather than rises as life expectancy increases.

Past trends in disability have varied by country and by the definition of disability in particular between milder disability and more severe disability impacting on ability to perform personal care tasks (Lafortune and Balestat, 2007).

Prevention can cover a wide range of measures with a number of objectives (Curry, 2006). Wistow and colleagues (2003) suggest that prevention be conceptualised as:

(a) preventing or delaying the need for care in higher cost, more intensive settings; and

(b) promoting the quality of life of older people and their engagement with the community.

In long-term care, emphasis has tended to be placed on interventions at an early stage of disability to prevent, reduce or delay the need for more intensive costly care at a later stage.

This report presents and discusses evidence from several European countries on measures to prevent or delay onset of disability in old age. The focus is on measures to reduce the disabling impact of chronic health conditions rather than on measures to prevent such conditions. We consider such services as measures to prevent social isolation and loneliness, reablement and falls prevention. We place emphasis on measures that enable disabled older people to remain in the community and avoid or delay admission to residential care. We do not consider policies to promote lifestyle changes (such as smoking cessation) or to manage long-term conditions more effectively (such as better control of blood pressure).

We used two methods to prepare this report: a rapid review of the literature and a review of the country reports[1] prepared by the CEQUA network on recent developments in European countries on the quality of long-term care. The aim of the rapid literature review was to summarise international evidence regarding the (cost-) effectiveness of preventative interventions, broadly defined. Narrative reviews, systematic reviews and meta-analyses in English were searched for in the Cochrane Library of Systematic Reviews, Google Scholar, PubMed and other relevant websites; academic and research reviews were included. The searches were not restricted by age group or country and included documents published between 2006 and 2016 (see Appendix A for full details of data sources and the key words used in searches). International evidence in English was supplemented by evidence from selected European countries in their respective national languages which covered both systematic reviews and individual small-scale case studies not included in international evidence. The objective was to capture very recent developments in prevention of disability across Europe which may not yet appear in academic literature but which have been identified as promising by policy experts participating in the present study.[2]

[1] Available online at www.cequa.org/copy-of-all-publications

[2] The present study is part of a larger research project, 'European network on long-term care quality and cost-effectiveness and dependency prevention', financed by the EU under grant agreement No. VS/2015/0276. For an overview of the project, including participating partners, see www.cequa.org/overview. Note that recent developments across Europe (discussed in section headed 'Examples of recent developments in Europe' below) have been drawn from country reports which can be found on the project website under publications.

Background: policy development in European countries

In **France**, the pursuit of prevention emerged in the long-term care sector through a National Programme for Healthy Ageing in 2003 which was extended in 2007 with the National Plan for Healthy Ageing (Le Bihan and Sopadzhiyan 2017). The plan is part of the international Healthy Ageing project which was launched by the EU in 2004. It develops a comprehensive approach based on prevention through a series of measures aiming at promoting 'successful ageing'. It was organised around various issues – prevention of complications of chronic diseases, promotion of positive health behaviours, improvement of the individual and collective environment, the development of seniors' social and cultural participation and reinforcement of intergenerational relations.

Three reports were delivered at the beginning of 2013 to prepare for a planned new Act on Adapting Society to an Ageing Population. They contained proposals on what had been announced as the three pillars of the forthcoming law: preparation for loss of autonomy (independence), adaptation of society, and care of elderly people. The role of municipalities through the creation of a network of 'age friendly cities' (*Réseau francophone des villes amies des ainés)* should also be mentioned. Created in 2012 as part of the OMS programme, it encourages cities to become more age friendly by adapting the social and material environment to the needs of old people.

The plan is based on two main principles (see National Action Plan for the Prevention of Loss of Autonomy, 2015, p. 11):

- The development of 'comprehensive prevention' defined as the active and responsible management of the 'capital of autonomy' of each person or group of people.
- The devolution of the implementation to local actors on the ground within a specific frame and precise objectives.

The plan is structured around six axes considering the whole life of the person and not only the years when limitations related to ageing occur: improve health and autonomy determinants, prevent avoidable loss of autonomy (independence), avoid the worsening of existing incapacities, reduce social and territorial health inequalities, train professionals in prevention of loss of autonomy and develop research and assessment procedures.

In Germany, over the last decade, key efforts to reduce dependency have focused on health promotion and prevention activities that address the entire life course (Frisina Doetter and Rothgang 2017). These have culminated in the definition of national targets for 'Healthy Ageing' in 2012, followed by the passing of the Preventive Health Care Act (Präventionsgesetz or PHCA) of 2015 (Frisina-Doetter et al, 2017). As concerns the former, a process of defining national health targets was initiated in as early as 2000 in line with a resolution of the Conference of Health Ministers in 1999 (Golinowska et al., 2017). This resulted in a detailed report on 'Healthy Ageing' as one of eight targets. The report comprised guidelines and recommendations focusing on three areas of activity in particular: (1) health promotion and prevention to preserve autonomy, including efforts to increase social participation and physical activity, as well as to improve the diet and oral hygiene of the elderly; (2) better access to medical and psychosocial services and nursing care, as well as improved conditions for caregivers; and (3) endeavours to address the special challenges surrounding the wellbeing of older disabled people, such as the improvement of mental health and dementia (ibid, p. 26).

One goal of the PHCA of 2015, in view of substantial variations between and within states in the nature and scope of health promotion/prevention activities, has been to institutionalize a framework for cooperation that integrates a wider range of actors and levels in the development of interventions, with

a far more pronounced role for social insurance.[3] The law has also aimed to increase early access to LTC services as a means of delaying progression to advanced care level grades – and thereby more costly forms of dependency.

The PHCA has established:

- a new mandate for prevention within the S-LTCI system, which also provides for activities to promote the health of those already in residential care;
- a strong emphasis on vaccination as part of all routine health check-ups;
- a commitment to developing programs aimed at the personalization of early detection of disease for all age groups;
- a commitment on the part of the health and LTC insurance providers to invest more than €500 million per year in setting-oriented health promotion and prevention activities;
- increased financial support (of about €30 million) for self-help groups; and
- new measures to improve cooperation and coordination among policy actors at the various levels involved in health promotion and prevention for all age groups, as well as new forms of cooperation between all branches of the social insurance system.

The PHCA introduced a new central structure referred to as the National Prevention Conference (*Die Nationale Präventionskonferenz*, NPC) which consists of representatives of the social insurance funds and private health insurers as well as a consultative role for a range of stakeholders (Golinowska et al., 2017). Thus far, the main contribution of the NPC has been the development of a national prevention strategy, which included the adoption of national basic recommendations on health promotion and prevention in 2016 (NPC, 2016). The recommendations incorporated a focus on healthy ageing and defined relevant areas of activity, target groups and participating institutions. The recommendations presently serve as a basis for framework agreements being adopted by the 16 German states. These will further specify the responsibilities and coordination activities of public health institutions and service providers. Just how these efforts will ultimately translate into programs and projects, as well as their potential for reducing dependency, remain to be seen.

In Italy, chronic conditions and disability are extensively addressed in the 'National Prevention Plan' (*Piano Nazionale della Prevenzione*) (Barbabella et al 2017). The latest available prevention plan covers the period 2014–2018 and stresses several so-called 'macro-objectives', including that of reducing the burden of non-communicable diseases. The strategies (often called 'the programmes') for achieving this objective are then defined autonomously by each region, which has the duty to create its own 'Regional Prevention Plan'. The regional plans detail programmes, related interventions and indicators. The Ministry of Health uses the indicators for monitoring progress during the duration of the plan.

The Ministry of Health recently promoted a 'National Plan for Chronic Diseases' (*Piano Nazionale Cronicità*) , with the aim of harmonising interventions at regional and local level in the area of chronic disease management. The document has been approved by all regions and now represents the main strategic reference for all interventions and policies aimed at improving the quality of life of individuals affected by chronic diseases and their families.

The first part of the document contains general principles for policymaking in the field, while the second contains disease-specific recommendations for the implementation of care pathways (the so-called *Percorsi Diagnostici Terapeutici Assistenziali*, PDTA) for the following diseases/conditions: renal, rheumatic, gastrointestinal, cardiovascular, neurodegenerative, respiratory and endocrine.

[3] The PHCA relies on the cooperation of the private health insurance providers and P-LTCI, however, it centres on the social insurance system which falls within the jurisdiction of the federal government.

For each condition, the plan provides a brief epidemiological overview, a list of major critical issues and the definition of the recommended interventions in that area, including general and specific objectives, expected results and indicators for monitoring the effectiveness and efficiency of the care provided. The National Plan for Chronic Diseases is the most significant current initiative in Italy for the implementation of cost-effective interventions to reduce disease-related dependency.

Interventions and policy measures targeting dependency using a cost-effective approach are not common in Italy, being in most cases loosely integrated with routinely provided care services. The Italian welfare state is still focused on measures to addressing existing dependency, rather than trying to prevent it. Concrete examples of policies that explicitly address the need to reduce dependency cost-effectively are therefore hard to find, outside the context of the regional health plans.

Evidence on prevention interventions and recent examples from Europe

An overview

Knowledge of what works and for whom in the field of prevention of disability is underdeveloped and fragmented. Studies often highlight the complexity of preventative interventions and the challenges of evaluating them. Assessing effectiveness and cost-effectiveness in prevention can be challenging for several reasons. These include the lack of a shared understanding of what prevention comprises, the use of various interventions simultaneously, the multidimensionality of the outcomes of preventative measures, the long time periods required to assess outcomes and any eventual savings and the difficulty of obtaining data to assess what would have happened in the absence of the preventative interventions. Demonstrating a causal relationship between preventative interventions and outcomes is difficult, since a range of factors and practices can interact simultaneously to produce an outcome (Curry, 2006; Knapp, 2013; Lombard, 2013; Miller and Allen, 2013).

A body of evidence in the field of prevention of disability is emerging. The existing evidence on effectiveness and cost-effectiveness of preventative measures is concentrated on the areas of reablement (see, for example, Cochrane et al., 2016; Croker et al., 2012; Glendinning et al., 2010; Legg et al., 2016), falls prevention (Bunn et al., 2014; Cameron et al., 2012; Farag et al., 2015; Gillespie et al., 2012; Keall et al., 2015) and various forms of community interventions (Cook et al., 2013; Coulton et al., 2015; Haslam et al., 2014; Lawlor, 2014; Pitkala et al., 2009; Skingley et al., 2015). The majority of studies present evidence from the US, UK, Canada, New Zealand, Australia and a number of European countries (e.g. Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, Sweden, and Switzerland). There is a lack of evaluations from Central and Eastern European countries.

Despite a common belief that a more preventative approach will improve the effectiveness and cost-effectiveness of long-term care systems, reviews highlight the limitations of the available research and the inconclusive nature of its findings. They highlight in particular the lack of economic analysis of the cost-effectiveness of prevention programmes and show that full economic evaluations are relatively rare but cost analyses are more common (Cameron et al., 2012; Cochrane et al., 2016). Moreover, reviews often note not just the limited volume of research evidence on prevention of disability but also the use of heterogeneous and/or unclear outcome measures, short follow-up periods, unclear definitions of preventative services, ill-defined and potentially highly heterogeneous groups of service users and overall poor quality of studies. Reviews also note that, because individual evaluations often include only a small sample of service users, their findings cannot illustrate sub-group effects, which are critical for service targeting. Moreover, studies

tend to follow up their sample of service users and observe the effects of the preventative interventions over a relatively short period of time (Bunn et al., 2014; Legg et al., 2016), potentially too short to be confident about their sustained effects. The ambiguous or inconclusive findings of recent studies do not necessarily mean that pursuing preventative approaches is not worthwhile: the inconsistencies may simply reflect that different types of preventative interventions make different impacts in different contexts and for different recipient groups. This suggests that care needs to be taken in translating evidence to different contexts and population groups from those studied.

Preventing social isolation and loneliness

The literature highlights the link between social isolation and loneliness and poor outcomes related to lowered quality of life, cognitive impairment, disability, reduced wellbeing and loss of independence, which can lead to an increased use of social care services and increased mortality. Consequently, it is recognised that preventative services should aim to reduce social isolation and loneliness and promote social inclusion. These are generally in the spectrum of primary prevention. Interventions aiming to reduce social isolation may include at the individual level befriending and at the collective level a range of services from lunch clubs to schemes that help people widen their social circles or promote health and wellbeing. Wider community programmes promote participation in various activities (e.g. sport, libraries) as well as joining and using outreach and volunteer programmes (Dickens et al., 2011; Lawlor, 2014; Windle et al., 2011).

While we consider measures to reduce social isolation and to reduce loneliness together, it is important to recognise that they are not the same. Social isolation relates to lack of contact with family, friends or other people. The extent of social isolation can be assessed from data about the frequency and duration of such contacts. Loneliness is an emotional feeling, which may or may not be accompanied by social isolation. It can be assessed only by asking people whether they feel lonely. We consider the two together since social isolation is a risk factor for loneliness and measures to reduce social isolation seem likely to reduce loneliness.

There is some evidence that interventions can improve psychological and physical wellbeing. Only one systematic review exploring interventions to prevent social isolation was identified. The review by Dickens and colleagues (2011) of 32 studies[4] noted that across social, mental and physical health, 79% of group-based interventions and 55% of one-to-one interventions reported at least one improved participant outcome (such as reduced loneliness, depression, isolation, boredom, helplessness or increased self-esteem or number of new relationships formed). Regarding the type of intervention provided (Table 6), six out of the seven (86%) activity interventions had at least one beneficial effect across the three domains of social, mental and physical health. Twelve out of the 15 (80%) support interventions reported beneficial effects. Three out of five (60%) home visiting interventions led to beneficial effects, as did one of the four (25%) interventions offering internet training. The remaining interventions concerned service provision, and reported beneficial effects. The authors however highlighted poor reporting of analyses in the primary studies, which was evident from a lack of intervention effect, including the absence of statistical significance values and participant-level outcome data for some outcome measures. (See Table 1 in Appendix B for a summary of the main findings.)

[4] Sixteen RCTs and 16 quasi-experimental studies were included, with a total of 4,061 participants. Interventions were categorised as: (a) activities (social or physical programmes), (b) support (discussion, counselling, therapy or education), (c) internet training, d) home visiting or e) service provision. Only 12 out of 32 (38%) studies explicitly targeted people identified as being socially isolated or lonely via study assessment or prior self- or professional- assessment. The remaining studies targeted people for whom social isolation and loneliness was implied or assumed based on personal circumstance, such as being a resident in a nursing home or a caregiver.

A number of primary evaluations from European countries demonstrated the effectiveness of interventions to prevent social isolation and loneliness. For example, a Finnish longitudinal randomised control study in seven daycare centres found that socially stimulating group activities including 'art and inspiring activities', 'group exercise and discussion' and 'therapeutic writing and group therapy' reduced isolation and loneliness in older people and also improved wellbeing and cognitive function (Pitkala et al., 2009). The positive effects were found to have persisted at 1-year follow-up. The intervention group had significantly lower health care costs during the follow-up: the difference between the groups was €943 per person per year. The study also found a statistically significant difference in overall costs between the control and intervention groups (€943 and €881 respectively per person per year). The survival rate after two years was higher in the intervention group (97%) compared to the control group (90%).

An RCT of ten home visits by a volunteer to community dwelling older adults experiencing loneliness in Ireland found decreased loneliness in the intervention group at one month and three month follow-up and a decrease in loneliness of the volunteer. At three month follow up the control group had significantly higher scores on the depression item as well as on social and emotional loneliness scale, although social network scale scores did not differ significantly between the groups (Lawlor, 2014). A 14-week community singing group initiative in the UK found positive results (reductions in depression and anxiety, increases in mental health related quality of life at three months). An RCT of community singing programme for older people in England had a significant effect on mental health-related quality of life (SF12), anxiety and depression at six months, and the study reported that the intervention was marginally more cost-effective than usual activities (Coulton et al., 2015). A hen-keeping project in England where volunteers were trained to establish hen-houses and support other older people to maintain them reported a significant improvement in well-being at nine month follow up but it did not result in any change in reported loneliness (Cook et al., 2013). Reductions in depression and anxiety had disappeared by six month follow-up, although health-related quality of life improvements remained (Skingley et al., 2015).

In the English Partnership for Older People Project (POPP), of the 146 projects included in 29 sites, two-thirds[5] were primarily directed at reducing social isolation and exclusion or promoting healthy living among older people. Across projects, individuals reported a small deterioration in self-reported quality of life following the POPP intervention. However, considering the POPP projects as a whole, it was estimated that there was a very high probability (86%) that the overarching POPP programme was cost-effective compared with usual care (Windle et al., 2009). Knapp et al. (2010) used decision modelling to demonstrate the economic impact of befriending interventions, time banks and community navigators in England, compared with what might have happened in the absence of such initiatives. They estimated that the value of the economic consequences of participation in a time bank was more than £1,300 while the average cost was less than £450 per year. Similarly, the economic benefits from community navigators were estimated at £900 and the costs at around £480.

Gardiner, Geldhenuys and Gott (2018) recently undertook a systematic review of interventions to reduce social isolation and loneliness among older people. The aim of their study was 'to conduct an integrative review to identify the range and scope of interventions that target social isolation and loneliness among older people, to gain insight into why interventions are successful and to determine the effectiveness of those interventions'.

[5] The remaining one-third focused primarily on avoiding hospital admission or facilitating early discharge from acute or institutional care ('hospital facing'). Some addressed the full spectrum of needs. In addition to these 'core' projects, a further 530 small 'upstream' projects were commissioned from the third sector.

A thematic analysis identified six categories of intervention based on their purpose, their mechanisms of action, and their intended outcomes. They were social facilitation interventions, psychological therapies, health and social care provision, animal interventions, befriending interventions, and leisure/skill development. The authors concluded that the majority of interventions reported some success in reducing social isolation and loneliness, but the quality of evidence was generally weak. They found that the factors associated with the most effective interventions included adaptability, a community development approach, and productive engagement. Of the 39 studies which met the inclusion criteria for their review, 13 related to studies of interventions in European countries, mainly Finland, the Netherlands and UK. Those conducted in these three countries and of relatively higher quality include:

- A qualitative study of charity-funded friendship clubs in the UK where participants meet for two hours every week. Participants perceived benefits of improved wellbeing and social relation including identity, practical emotional support, friendship, inclusivity and social ties (Hemingway and Jack, 2013).
- A study of a Friendship Enrichment Programme in the Netherlands, which involved 12 weekly group lessons in self-esteem, relational competence, phases in friendship formation and social skills. A follow-up found a significant reduction of loneliness within a year after beginning the programme, with a combination of developing new friendships and improving existing friendships reducing loneliness (Stevens et al., 2006).
- A randomised control trial (RCT) of psychological group rehabilitation in Finland, in which facilitated groups met once a week for three months with the aim to empower participants and promote friendships: the RCT found no differences in loneliness or social networks between the groups but a significantly larger proportion of intervention group participants had found new friends during the follow-up year (Routasalo et al., 2008).
- A study of a video network in the Netherlands which allowed users to contact a nurse 24/7 and to interact with carers, friends and family. There was a significant decrease in loneliness for older users (Loek et al., 2012).
- An RCT of geriatric rehabilitation in Finland, which comprised one to one meetings plus group rehabilitation during three inpatient periods during eight months, with a focus on exercise, group discussion and lectures. The RCT found a decrease in loneliness over 12 months and improvement in subjective health for the intervention group (Ollonqvist et al., 2008).
- A qualitative study of a national pilot comprising eight telephone befriending support projects in the UK, where volunteers provided emotional support for older people. Qualitative in-depth semi-structured interviews, to explore the impact of telephone befriending on wellbeing, found a reported decrease in loneliness (Cattan et al., 2011).

A quasi-experimental study of a computer training course in Finland and Slovenia, involving three sessions over three weeks, including basic IT skills, writing documents, and training on Skype and internet use. The study included data collection at baseline and three week follow-up found a significant reduction in loneliness and a correlation between email usage and lower reports of loneliness but no reported change in loneliness among those using Skype (Blazun et al., 2012).

Reablement, exercise and ability to perform activities of daily living (ADLs)

Evidence on reablement is limited. For example, Legg and colleagues (2016) found no studies of sufficient quality to include in their systematic review, and they pointed to the unclear definition of what constitutes reablement services. Cochrane and colleagues' (2016) Cochrane review included only two studies (one Australian and one Norwegian)

comparing reablement with usual home-care services, but both studies were assessed as of very low quality. The authors concluded that low quality evidence suggested that reablement may be slightly more effective than usual care in improving function at nine to 12 months and that reablement may make little or no difference to mortality at 12 months' follow-up or rates of unplanned hospital admission at 24 months. The review also reported that the total aggregate costs for homecare and healthcare (emergency department and unplanned hospital admissions) in the intervention group over 24 months was lower than in the control group (based on one study).

There is some evidence from a systematic review by Whitehead et al. (2015)[6] that interventions aiming to improve ability to independently perform ADLs are effective for a population of homecare service users, in comparison to standard homecare services in which assistance is provided with personal care tasks. Eight studies in the review included an ADL outcome (using different ADL measures). Five of them showed a positive outcome for the intervention group, but only two with statistical significance. There was some evidence that the interventions improve health-related quality of life but insufficient evidence to determine whether involvement of qualified occupational therapists influenced effectiveness. The authors however noted that the content of interventions varied widely.

The Cochrane review by Crocker et al. (2013) of rehabilitation interventions directed at maintaining or improving the physical function of older people in long-term care[7] concluded that physical rehabilitation at the end of the intervention resulted in improved ADL scores, functional independence and mobility. Synthesis of secondary outcomes suggested that there is a beneficial effect on strength, flexibility and balance, and possibly on mood, although the size of any such effect is unknown. No study included in the review performed a full cost-benefit analysis, but three studies assessed costs. In one study, a one-to-one physical therapy intervention was more expensive than the control (friendly visits) over four months, while other healthcare costs did not differ significantly between the groups. Another study calculated the cost of providing enhanced level physiotherapy and occupational therapy services as well as direct-care nursing costs and found that reductions in nursing costs outweighed the costs of the therapy services. A third study conducted a comparison between groups of the costs of evaluating and treating acute events and found no significant difference as a result of their intervention (Crocker et al., 2013). A Cochrane meta-analysis[8] concluded that the evidence of benefit from exercise on cognitive functioning for people with dementia is unclear (nine trials), and the authors rated the quality of the evidence as very low. There was some evidence that exercise programs can have positive impact on the ability of people with dementia to perform ADLs (six trials), but the quality of the evidence was also rated as very low (Forbes et al., 2015). (See Table 2 in the Appendixes for a summary of the main findings.)

[6] Thirteen studies were included: six RCTs and seven controlled before and after studies with a total of 4,975 participants. Ten (77%) were judged to have risk of bias. Interventions were categorised as those termed 'reablement' or 'restorative homecare' (n=5/13); and those involving separate components which were not described using this terminology (n=8/13).

[7] Sixty-seven randomised and cluster randomised controlled trials involving 6,300 participants were included. Fifty-one trials reported the primary outcome, a measure of activities of daily living.

[8] Thirteen RCTs, but these were highly heterogeneous in terms of subtype and severity of participants' dementia, and type, duration, and frequency of exercise. Only two trials included participants living at home.

Examples of recent developments in Europe

The National Plan for Chronic Disease published by the Ministry of Health in **Italy** contains recommendations for people with Parkinson's disease (Barbabella et al. 2017), including:

- provide training opportunities for all professionals in primary care settings
- promote early diagnosis interventions
- improve professionals' skills
- improve the adherence of available care pathways to existing clinical guidelines
- increase the availability of rehabilitation interventions
- define the characteristics and adequacy of hospital and out-patient facilities providing care for people with Parkinson's disease
- improve appropriateness and quality of care
- promote integration of care through new management tools shared by all professionals.

Additionally, for people with COPD, the plan recommends:

- create a respiratory score risk chart
- implement training programs and communication strategies to raise awareness of the disease
- increase multidisciplinary integration using care pathways
- develop programmes for the empowerment of patients
- increase the awareness of professionals and non-professionals of the importance of drug adherence and compliance
- improve effectiveness and efficiency of homecare services (oxygen therapy and mechanical ventilation)
- test new models for 'intermediate' care facilities able to meet accreditation standard at national level
- further develop respiratory rehabilitation
- invest in telemedicine-based models
- offer training and further development of the homecare services
- ensure mobility of the patients across different regions.

In **France**, the national action plan for the prevention of loss of autonomy published in 2015 was structured around six axes relating to reablement, considering the whole life of the person (Le Bihan and Sopadzhiyan 2017):

- improve health and autonomy determinants
- prevent avoidable loss of autonomy
- avoid the worsening of existing incapacities
- reduce social and territorial health inequalities
- train professionals in prevention of loss of autonomy and develop research and assessment procedures.

In the **Czech Republic**, health promotion and dependency prevention activities are often implemented by non-governmental institutions operating at the community level, in cooperation with service providers and residential care facilities (Sowa-Kofta 2017). These projects typically have financial support from the National Institute of Public Health, Ministry of Health, local governments, European Social Fund (ESF) as well as other sources. Examples of dependency prevention programmes implemented include the activities of Gerontocentrum (GEMA – centre for health support) in Prague. Their projects include organising dancing therapy for seniors living in residential care homes (aimed at improving their quality of life, strengthening their physical capacities, supporting their mental health, and preventing cognitive decline), organising memory training for seniors living in the community, and providing information on different aspects of life in older age, peer support and health education, among others.

In **Poland**, the report *Preconditions for Long-Term Senior Policy for the Period 2014–2020* stresses the importance of activity for people aged over 50 and over 60 years, including the improvement of education, adequate access to the labour market, adequate working conditions and effective and efficient measures to stimulate labour market participation by this group (Golinowska and Sowa-Kofta 2017). The report refers to the development of education for older people to improve their health literacy, civic education and education on new technologies. It recommends increased participation by older population in cultural activities. Other social activities suggested are the development of civic activities and the promotion of voluntary activities.

A specific programme addressing the goals of official senior policy is the ASOS Programme. This government programme supporting the social activity of older people was established in 2012 for the period 2012–2013, and was further extended for the period 2014–2020. There are four priority areas under which projects can be supported: education of older people, social activities promoting inter- and intra-generational solidarity, social participation of older people, and social services for older people. Most of the projects supported (85%) are in the first two priority areas of the programme. Thus, most of the resources are directed towards stimulating activities for older people rather than towards the support of services for older dependent people. The main providers supported are local governments and non-governmental organizations operating at the community level. An evaluation of the activities notes as drawbacks their short-term perspective, because these are activities planned for one year, and lack of sustainability in the long run.

Useful evidence is also provided from **Finland** by the Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) (Linnosmaa and Sääksvuori 2017). This study investigates the effectiveness of a multi-domain approach, including nutritional guidance, physical exercise and cognitive training. The results from this two-year randomised controlled trial suggest that these interventions could improve or maintain cognitive functioning in at-risk older people in the general population. The robustness of the reported results has however been questioned.

We analysed examples from three countries of approaches to sharing good practice to tackle challenges arising in aging societies. In **Italy**, regional prevention plans offer examples of programmes for reducing dependency. In Sardegna, a healthy community initiative includes activities aimed at increasing physical activity levels among citizens, including people aged over 64. In Friuli, Venezia and Giulia, a healthy community includes a number of activities aimed at increasing self-management skills among citizens, including the development of an app for the monitoring of cardiovascular risks, a course for professionals and awareness campaigns.

In **Sweden**, a report was published in late 2002 on a prevention project for older people who do not receive ongoing public help and support (Johansson and Schön 2017). Twenty-one municipalities with different geographic and socio-demographic profiles were included in the project. Over 4,000 older people (mostly aged 75 and over) participated, receiving regular home visits over a two to three-year period. The visits were carried out by district nurses, care managers, physiotherapists and occupational therapists. They provided information and advice on health care and eldercare systems and on health promotion, depending on the lifestyle and individual needs of the subjects. Fall prevention and nutrition were two important topics. All participants were encouraged and supported to take part in physical, mental and social activities. Most participants were satisfied with their present health and functional ability. One in ten however reported that they had problems with loneliness, anxiety, depression, pain or fatigue. Two out of three home visits resulted in interventions to promote health. For sedentary or isolated older people, activities were suggested and contact was established with voluntary organizations and befriending services (National Board of Health and Welfare, 2002).

In **Germany**, a process of defining national health targets was initiated as early as 2000 in line with a resolution of the Conference of Health Ministers in 1999 (Frisina Doetter and Rothgang 2017). Germany provides examples of good practice in health promotion and prevention from the year 2007.

The national action plan 'In Form' was a nationwide plan encompassing various projects, activities and online resources. Established in 2008 by the Ministry for Nutrition and Agriculture, as well as the Ministry of Health, In Form aims to improve the nutrition and activity patterns of people in all areas of life and at all life stages including old age. The New Ageing in Cities (NAIS) project was a volunteer project conducted in cooperation with the city of Bruchsal, which aims to develop local strategies to help older people to be more active, by increasing access to local services, improving care for the socio-economically disadvantaged, and promoting physical activity, better nutrition and mental health.

These projects paved the way for a detailed report on *Healthy Ageing* in 2012 defining national targets for this challenge and for the passing of the Preventive Health Care Act. The report comprised guidelines and recommendations focusing on three areas of activity, in particular health promotion and prevention to preserve autonomy, including efforts to increase social participation and physical activity as well as to improve the diet and oral hygiene of older people.

Glendinning's (2010) study in five local authorities in **England** found homecare reablement to be cost-effective compared with conventional homecare in relation to health-related quality of life outcomes but less cost-effective in relation to social care outcomes measured at nine to 12 months follow up. One English local study suggested that reablement reduced the need for homecare by 28 per cent (Glasby, 2012). Later research in four English local areas continued to find very high rates of success, but it was noted that users of reablement may fall into two groups, with one group experiencing immediate but relatively short-term benefits (three months) and the second group experiencing more sustained benefits (a year or longer) (Glasby, 2012).

In **Spain**, and interesting example of prevention of deterioration at home is the joint work of Riskcenter (UB) and the Centre for Independent Life (*Centro de Vida Independiente*, CVI), which is sponsored by Barcelona Town Hall. The intervention consists of making changes to the homes of people aged over 65 years living in the city.

First, social services offices identify potential beneficiaries of this program, which aims to install technical aids and/or make adaptations at home with the objective of increasing autonomy in daily life. Second, the CVI group studies each case and an expert team composed of a technical architect, a social worker and a paramedic evaluates the situation on-site to devise the best arrangements. Finally, the intervention is conducted and the person's situation is re-evaluated after three months.

Over ten years, more than one thousand older people have received help under this programme. The University of Barcelona carried out a study in 2015 evaluating self-reported improvements in limitations in basic activities (mobility, eating, taking a bath, dressing, using the telephone). The level of autonomy was measured before and after the intervention. The change in the indicator of self-reported dependency in terms of reduction in the need for help from other people and in terms of the preventative effect of the programme was significantly positive. The cost of the programme was much lower than the benefits in terms of quality of life and prevention of falls at home. Depending on the assumptions, benefits are double or triple the costs.

Falls prevention

There is some evidence on measures to reduce the rate of falls and/or risk of falling but the evidence is mixed. For example, there is evidence from a Cochrane review[9] that multiple-component group exercise significantly reduced the rate of falls (based on 16 RCTs) and the risk of falling (22 RCTs), as did multiple-component home-based exercise (seven RCTs). Overall, exercise interventions significantly reduced the risk of sustaining a fall-related fracture (six RCTs). Multifactorial interventions which included individual risk assessment reduced the rate of falls (19 RCTs) but not the risk of falling. Home safety assessment and modification interventions were effective in reducing the rate of falls (six RCTs) and risk of falling (seven RCTs). They were more effective for people at higher risk of falling, including those with severe visual impairment. An anti-slip shoe device reduced the rate of falls in icy conditions (one RCT). Multifaceted podiatry including foot and ankle exercises in people with disabling foot pain significantly reduced the rate of falls but not the risk of falling compared with standard podiatry (one RCT). The review noted that there was no evidence on the effect of cognitive behavioural interventions (one RCT) nor of interventions to increase knowledge about fall prevention (one RCT) on the rate of falls or risk of falling (Gillespie et al., 2012).

Twenty-four studies included in the review reported either an economic evaluation (cost-effectiveness or cost-utility analysis) or the cost of delivering the intervention or other healthcare costs. The review reported cost-effectiveness in terms of incremental cost per fall prevented, for exercise programmes (five RCTs), for home safety assessment and modification programmes delivered to those with severe vision loss (one RCT) and those recently in hospital (one study) and for multifactorial programmes (three RCTs). Three studies demonstrated potential for cost savings from delivering the intervention to particular subgroups of older people at high risk of falling. The interventions included: home-based physical exercise in over 80-year-olds (linked to fewer hospital admissions), home safety programmes delivered to individuals with a previous fall, and multifactorial programmes for individuals with four or more of the eight targeted risk factors (Gillespie et al., 2012).

Another Cochrane review of falls prevention for older people in care facilities and hospitals[10] noted that the results from 13 RCTs evaluating exercise interventions were inconsistent, but that overall there was no difference between intervention and control groups in the rate of falls (eight RCTs) or risk of falling (eight RCTs). Subgroup analysis by level of care suggested that exercise may reduce falls among people in intermediate level facilities but may increase falls in facilities providing high levels of nursing care. In sub-acute hospital wards additional physiotherapy did not significantly reduce the rate of falls (one trial) but significantly reduced the risk of falling (two RCTs). In one trial carpet flooring significantly increased the rate of falls compared with vinyl flooring and potentially increased the risk of falling. Another trial testing an educational session for patients at high risk of falling in acute wards showed a significant reduction in risk of falling. Overall, multifactorial interventions in hospitals reduced the rate of falls (four RCTs) although the evidence for risk of falling was inconclusive (three RCTs). Of these, one trial in a sub-acute setting reported that the effect was not apparent until after 45 days in hospital (Cameron et al., 2012).

[9] Based on 159 randomised controlled trials with 79,193 participants of fall prevention in the community. Most trials compared a fall prevention intervention with no intervention or an intervention not expected to reduce falls. The most common interventions tested were exercise as a single intervention (59 trials) and multifactorial programmes (40 trials). Sixty-two per cent (99/159) of trials were at low risk of bias for sequence generation, 60% for attrition bias for falls (66/110), 73% for attrition bias for fallers (96/131), and only 38% (60/159) for allocation concealment.

[10] Based on 60 randomised controlled trials in all (60,345 participants): 43 trials (30,373 participants) in care facilities, and 17 (29,972 participants) in hospitals.

Another systematic review[11] of falls prevention among older people with mental health problems (mostly in nursing and residential care homes) found inconsistent evidence. Eight of 14 studies found a reduction in fallers (statistically significant in five studies) and nine of 14 reported a significant reduction in rate or number of falls. Four studies however found a non-significant increase in falls. The authors concluded that multifactorial, multidisciplinary interventions and schemes involving exercise, medication review and increasing staff awareness appeared to reduce the risk of falls but the evidence is mixed and study quality varied (Bunn et al., 2014).

A recent review[12] of 22 fall prevention studies confirmed evidence on the cost-effectiveness of varied types of exercise/physical activity programmes in fall prevention (over 50% of studies included had less than one-year follow-up period). The quality of the studies did not appear to be associated with the nature of the findings, but the review noted that the same intervention might be assessed as cost-effective or not cost-effective depending on the way in which it was delivered and/or the economic evaluation method used. Moreover, the authors noted that the comparability of results is very limited due to differences in the methods as well as in the overall quality of the studies (Dubas-Jakobczyk et al., 2017). (See Table 3 in the Appendixes for a summary of the main findings.)

A recent systematic review assessed the effects (benefits and harms) of multifactorial interventions and multiple component interventions for preventing falls in older people living in the community (Hopewell et al., 2018). It included randomised controlled trials that evaluated the effects of multifactorial and multiple component interventions compared with control (usual care – no change in usual activities), attention control (social visits), or exercise as a single intervention.

The review included 62 trials involving 19,935 older people living in the community. It concluded that multifactorial interventions may reduce the rate of falls compared with usual care or attention control but that there may be little or no effect on other fall-related outcomes. It also found that multiple component interventions, usually including exercise, may reduce the rate of falls and risk of falling compared with usual care or attention control.

Forty-three of the trials involved multifactorial inventions, including exercise, environment or assistive technologies, medication review and psychological interventions. Multifactorial interventions may reduce the rate of falls compared with control, such that, if 1,000 people were followed over one year, the number of falls might be 1,784 (95% CI 1,553 to 2,016) after multifactorial intervention versus 2,317 after usual care or attention control. They make little or no difference in the risks of falling (i.e. people sustaining one or more fall), recurrent falls, fall-related hospital admission and requiring medical attention. They may reduce the risk of fall-related fractures and may slightly improve health-related quality of life. The evidence for these findings however was generally of low quality.

Seventeen of the trials involved multiple component interventions, which usually included exercise and another component, commonly education or home-hazard assessment. The review found moderate-quality evidence that multiple interventions probably reduce the rate of falls and risk of falls. It found low-quality evidence that multiple interventions may reduce the risk of recurrent falls (although a small increase cannot be ruled out) and that they may have little or no effect on the risk of requiring medical attention but may slightly improve health-related quality of life.

Another recent systematic review aimed to provide a comprehensive overview of economic evaluations of

[11] The review included 17 RCTs and four uncontrolled studies; 11 involved single interventions and ten multifactorial. Searches were conducted in a wide range of sources (e.g. Pubmed, NHS Evidence, Cochrane Library, Google Scholar) up to October 2013.

[12] The review included 29 papers, most of which (22) focused on fall prevention strategies.

falls prevention programs and to evaluate the methodology and quality of these studies (Olij et al., 2018). It included 31 studies of older people living in the community, 25 studies of older people living in residential care and three studies covering both groups. The studies were mostly of good quality, although there was some variation between studies.

Around two-thirds of the studies reported that the interventions evaluated were cost-effective, at an incremental cost effectiveness ratio below $50,000 per QALY. These included all six studies of home assessment and all four medication adjustment programs. The nine studies of exercise and 11 studies of multifactorial interventions produced varied findings. Home assessment programs were the most cost-effective type of program for older people living in the community and medication adjustment programs were the most cost-effective for older people living in a residential care facility.

Conclusions: policy implications and next steps

The available evidence on what works and for whom in the field of prevention of disability is underdeveloped and fragmented. Studies often highlight the complexity of preventative interventions and the challenges of evaluating them. In particular, demonstrating a causal relationship between preventative interventions and outcomes is difficult, since a range of factors and practices can interact to produce an outcome.

The evidence on effectiveness and cost-effectiveness of preventative measures is concentrated on the areas of reablement, falls prevention and various community interventions. The majority of studies present evidence from the US, Canada, New Zealand, Australia or western European countries. This report has presented a review of evidence relating to prevention of social isolation and loneliness, reablement and falls prevention and examples of recent developments in European countries. This is intended to inform the development of policy and practice on prevention of disability and the development of priorities for future research.

Despite a common belief that a more preventative approach will improve the effectiveness and cost-effectiveness of long-term care systems, reviews highlight the limitations of the available research and inconclusive nature of its findings. They highlight in particular the lack of economic analysis of the cost-effectiveness of prevention programmes. More high-quality evaluations are needed.

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Appendix A: Literature review data sources and key search terms

Key sources of evidence

AFE-INNOVNET

Age UK

British Geriatrics Society

Cochrane

European Commission

Google Scholar

Interlinks

King's Fund

Mentoring and Befriending Foundation

MOPACT

NCBI – PubMed

NHS Confederation

NICE – Evidence Search

OCED

OPM

RAND

SCiE

ScienceDirect

WHO

Key search terms combined three sets of keywords from the areas below:

Keywords about the policy area, for example:

- long-term care; social care; dependency; disability; aged care

Keywords about the nature of the interventions, for example:

- prevention; rehabilitation; reablement; falls; disability, befriending, community navigators, preventing loneliness, social isolation

Keywords about the consequences of interventions, for example:

- costs; resources; cost-effectiveness; efficiency; savings
- effects; effectiveness; outcomes; outputs; wellbeing; satisfaction

Appendix B: Tables with main findings from rapid literature review

Table 1. Preventing social isolation and loneliness: main findings

INTERVENTIONS	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COST-EFFECTIVENESS
Review: Dickens et al. (2011)				
Activities – group and one-to-one (psychosocial intervention, group activities)	Positive effects (five studies) One study had positive effect on social ties and new relationships, however, no difference was found between control and intervention group for loneliness, depression or self-esteem	No effect (one study)	None reported	Not reported
Support intervention (group, individual or combined group plus individual intervention) Interventions included: • coping group intervention • psychosocial intervention • bereavement support group • discussion group • educational friendship programme • mental health counselling group • cognitive behavioural therapy • group therapy	Positive effects (12 studies)	No effect (three studies)	None reported	Not reported
Internet training	Positive effect in reducing loneliness but no difference in the sub-scales of social and emotional loneliness (one study)	No effect (three studies)	None reported	Not reported
Home visiting (one to one interventions)	Positive effect (three studies)	No effect (two studies)	None reported	Not reported
Service provision interventions (alternative form of nursing home care, whereby nursing home residents had daily contact with children, pets and plants)	Positive effect on some outcomes (reduced helplessness and boredom) but no effect on loneliness (one study)			

Table 2. Reablement and ability to perform ADLs: main findings

TYPE OF INTERVENTION	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COSTS AND COST-EFFECTIVENESS
Cochrane et al. (2016)				
Reablement/restorative homecare	Slightly improved functioning (two studies)	No effects on mortality or unplanned hospital admission rates (two studies)	None reported	The total aggregated costs over 24 months was lower compared to the control group (one study)
Whitehead et al. (2015)				
Reablement/restorative homecare (four studies)	Positive not significant effects (two studies)	No effect (three studies)	None reported	Service users were being provided with less care or less costly care at the final follow-up point (three studies)
Nurse-led health promotion	Positive effect (one study)	No difference between intervention and control groups (one study)	None reported	Not reported
Cluster care	Change scores only reported (one study)		None reported	Service users were being provided with less care or less costly care at the final follow-up
Specialist interprofessional stroke care	Positive effect (one study)		None reported	
Goal-setting	Positive effect (one study)		None reported	
Occupational therapy bathing intervention	Of 19 ADL activities, 7 showed significant improvement in both groups and 6 activities in the intervention group only (one study)		None reported	Service users were being provided with less care or less costly care at the final follow-up point

Table 2. Reablement and ability to perform ADLs: main findings

TYPE OF INTERVENTION	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COSTS AND COST-EFFECTIVENESS
Crocker et al. (2013)				
Physical interventions/ rehabilitation (e.g. physical therapy intervention; enhanced level physiotherapy and occupational therapy, strength and balance exercises, walking, mobility, resistance and coordination exercises, rowing)	Barthel Index (0 to 100) scores improved by 6 points (seven studies) Functional Independence Measure (0 to 126) improved by 5 points (four studies) Rivermead Mobility Index (0 to 15) scores improved by 0.7 points (three studies) Timed Up and Go test improvement by five seconds (seven studies) Walking speed improvement by 0.03 m/s (nine studies).		None reported	One study showed higher costs for physical therapy intervention than the control One study concluded that reductions in nursing costs outweighed the cost of enhanced level physiotherapy and occupational therapy service (however it did not test significance) One study found no significant difference in costs
Forbes et al. (2015)				
Exercise programmes which included any combination of aerobic, strength or balance training, offered over any period of time.	Some positive effect on ADL: the meta-analysis yielded an estimated standardised mean difference (SMD) between exercise and control groups of 0.68 favouring the exercise group (six trials) No adverse events that could be attributed to the exercise intervention (five trials)		No clear conclusion regarding cognitive effect on functioning (nine trials) The estimated SMD between exercise and control groups was 0.43 (nine studies, but substantial heterogeneity in the analysis).	

Table 3. Falls prevention: main findings

INTERVENTIONS	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COST-EFFECTIVENESS
Gillespie et al. (2012)				
Group and home-based exercise programmes	Reduced risk of fractures (six RCTs) Statistically significant reduction in rate of falls (27 trials) Risk of falling (28 trials)	No effect on risk of falling (three trials) No decrease in rate of falls (one trial)	Adverse events from the intervention (injuries) (two trials)	Cost-effectiveness – incremental cost per fall prevented (five trials) Cost savings for people over 80 years old – fewer hospital admissions (one trial)
Tai chi	Reduced rate of falls (five trials, but substantial statistical heterogeneity) Reduced the risk of falling (six trials)		None reported	Not reported
Multifactorial interventions	Reduced rate of falls (19 RCTs)	No effect on rate of falling (19 RCTs)	None reported	Cost-effectiveness – incremental cost per fall prevented (one trial) Cost savings – for those with 4+ of 8 targeted risk factors (one trial)
Home safety assessment and modification interventions	Effective in reducing rate of falls (six RCTs) and risk of falling (seven RCTs)		None reported	Cost-effectiveness – incremental cost per fall prevented – for those with severe vision loss (one trial) and those recently in hospital (one trial) Cost savings – for people with a previous fall (one trial)
An anti-slip shoe device	Reduced rate of falls in icy conditions (one RCT)		None reported	Not reported
Multifaceted podiatry including foot and ankle exercises	Reduced the rate of falls (one RCT)	No effect on risk of falling (one RCT)	None reported	Not reported
Cognitive behavioural interventions		No evidence of effect (one RCT)	None reported	Not reported
Interventions to increase knowledge/ educate about fall prevention		No evidence of effect on rate of falls or risk of falling (one RCT).	None reported	Not reported

Table 3. Falls prevention: main findings (continued)

INTERVENTIONS	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COST-EFFECTIVENESS
Cameron et al. (2012)				
Exercise interventions in care facilities	People in intermediate level facilities – post hoc subgroup analysis by level of care suggested that exercise might reduce falls (eight trials)	Overall no difference between intervention and control groups in rate of falls (eight trials) or risk of falling (eight trials)	Facilities providing high levels of nursing care – post hoc subgroup analysis by level of care suggested that exercise might increase falls (eight trials)	Not reported
Physiotherapy in subacute wards in hospital	A significant reduction in risk of falling (two trials)	No significant reduction in rate of falls (one trial)	None reported	No differences in healthcare costs
Multifactorial interventions in care facilities	Reduced rate of falls (four trials) and risk of falling (three trials)		None reported	Not reported
Multidisciplinary care in a care facility	Significantly reduced rate of falls and risk of falling after hip fracture surgery (one trial)		None reported	Not reported
Carpet flooring in a care facility			Significantly increased rate of falls compared with vinyl flooring and potentially increased the risk of falling (one trial)	Not reported
Knowledge interventions in a care facility (educational sessions)	A significant reduction in risk of falling		No reduction in rates of falls or in risk of falling (one trial)	Not reported
A wireless position-monitoring device in a care facility		No significant reduction in the rate of falls (one trial)	None reported	Assuming 35 injurious falls per 100 residents/ year, annual savings for 100-resident facility: USD 429 if 12% fewer injurious falls; USD 232,953 if 50% fewer injurious falls
Staff training or service model change (e.g. staff education on fall/fracture prevention, guideline implementation, a risk assessment tool versus nurses' judgement)		None of the reported interventions reduced falls in care facilities (five trials)	None reported	Not reported

Table 3. Falls prevention: main findings (continued)

INTERVENTIONS	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COST-EFFECTIVENESS
Bunn et al. (2014)				
Exercise	Reduced fallers (one study) Reduced numbers of falls and hip fractures (one study)	No difference in fallers (one study)	None reported	Not reported
Environment/assistive technology	Reduced rate of falls (one study)		None reported	Not reported
Social environment (e.g. supervision, individualised advice)	Reduced fallers and rates of falls (two studies)		Increased rates of falling (one study)	Not reported
Knowledge	Reduced fallers (one study)	No reduction in rates of falls (one study)	Increased fallers and rates of falls (one study)	Not reported
Sensory stimulation	A non-significant reduction in number of fallers, and gignificant reduction in incidence of falls (one study)	No difference in the number of falls (one study)	None reported	Not reported
Multi-factorial interventions	Eight studies found positive effects (three out of eight non-significant)	No difference (one study)	A non-significant increase in fallers and falls (one study)	Not reported

Table 3. Falls prevention: main findings (continued)

INTERVENTIONS	POSITIVE EFFECTS	NO EFFECTS	NEGATIVE EFFECTS	COST-EFFECTIVENESS
Dubas-Jakobczyk et al. (2017)				
Physical exercise; exercise programmes; physical activity	The positive effect or cost reduction is indicated, but there is a lack of a clear message concerning the cost-effectiveness (two studies)		None reported	Intervention cost-effective or cost-saving or had a favourable cost-benefit ratio (five studies) Intervention not cost-effective or effect not significant or positive effect was recognised only partially (two studies)
Tai chi	One study indicated positive effect or cost reduction, but there is a lack of a clear message concerning the cost-effectiveness. One of the analysed interventions was considered to be the more favourable (two studies)		None reported	Intervention cost-effective or cost-saving or favourable cost-benefit ratio (in case of CBA) (one study) Intervention not cost-effective or effect not significant or positive effect was recognised only partially (one study)
Multifactorial interventions				The cost-effectiveness depends on an acceptable threshold or other assumptions; decision to introduce the intervention is left to consideration (two studies)
Home modifications				Cost-effective (one study)
Home visits				Intervention was cost-effective or cost-saving or had a favourable cost-benefit ratio (one study) Cost-effectiveness depended on an acceptable threshold or other assumptions (one study)
Educational interventions				Interventions considered not to be cost-effective or cost-saving (one study)