

This paper introduces discussion of a reablement model specific to the management of diabetes mellitus in older adults, within the context of literature related to the treatment and prevention of diabetes and of its longer-term complications. The reablement health and social care model for older people is relatively new and as a result research is not yet strong, particularly in the area of older people with diabetes. However, evidence on reablement interventions for frail older people and older adults with dementia is somewhat more robust and of interest to this discussion since older adults with diabetes are disproportionately represented in the two populations of the frail elderly and older people with cognitive impairment and dementia. The literature reviewed for this paper is available in the English language, and covers research conducted in Australia, Canada, northern and southern Europe, New Zealand, the United Kingdom and the United States of America.

Key Facts about Diabetes in an Ageing Society

- Diabetes is the world's fastest growing chronic disease.
- In 2014, diabetes affected an estimated 387 million people around the world (43% of whom were undiagnosed), a number that is predicted to grow 205 million more by the year 2035. Approximately 316 million people had impaired glucose tolerance, placing them at significant risk of developing diabetes, and this group is expected to increase to 471 million by 2035.
- More than 25% of people over the age of 65 years around the world have diabetes, and approximately 50% have pre-diabetes. Type 2 diabetes is far more prevalent than type 1 in older age groups, accounting for more than 90% of cases.
- Long-term complications of diabetes cause immeasurable physical and emotional suffering and account for high mortality rates— for example, 5.1 million diabetes-related deaths globally in 2013.
- Co-morbidities include: cardiovascular and cerebrovascular disease, peripheral nerve dysfunction, diabetic retinopathy that can lead to blindness, foot ulceration leading to amputation, kidney dysfunction leading to renal failure and vascular dementia. Diabetes is also an independent risk factor in older people for problems such as injury from falling and cognitive dysfunction and decline.
- All co-morbidities undermine independence, capacity for self-care and quality of life.
- USD 612 billion—or 1 in every 9 healthcare dollars—was spent on diabetes treatment and care in 2014 globally, 76% of which was consumed in the care of people with diabetes between 50 and 79 years of age. Approximately 35% to 40% of diabetes-related expenditure is associated with the management of vascular complications, such as heart and kidney disease, and hospitalisation.
- Costs of care for older individuals with diabetes who are unable to maintain their independence are three-fold in the community and nine-fold in institutional care.

Treatment and Care of Older People with Diabetes

The current clinical view extends the previous classification of diabetes in older people as a preventable insulin resistance syndrome and cardiovascular disorder to include recognition of it as a premature ageing syndrome, a cause of unsuccessful ageing and a disabling syndrome (Ghosh, 2006). Modern management of the disease is informed by the 2014 International Diabetes Federation (IDF) Global Guideline pertaining to the care of older adults with Type 2 diabetes. Key Guideline principles are: individualised care planning based on holistic principles; proactive risk identification and minimisation strategies; early detection of deterioration through screening and other measures; and education and support for older people with diabetes, their caregiver and the allied health team. Adoption of a healthy diet and increasing physical

activity levels are key to achieving optimal control of diabetes and preventing the development of complications. This requires the person with diabetes and/or their caregiver to be well-educated in these lifestyle aspects of self-management, in addition to the need where appropriate for medication for diabetes and associated morbidities such as hypertension, hyperlipidaemia and vascular disease (IDF, 2014). A multi-disciplinary approach is viewed as essential. It is recommended that care models be founded on a comprehensive geriatric assessment, as this measure has demonstrated success in improved health status and increased quality of life, fewer admissions to institutional care facilities and a reduction in mortality rates (Sinclair, 2015a, 2005).

The IDF Guideline categorises varying levels of dependency upon which to base health and social care interventions. These categories commence with a functionally independent status and progress to functionally dependent (some loss of function with impairment of ability to perform activities of daily living [ADL]) and increased need for additional social and perhaps medical care. This category is sub-divided to accommodate the high incidence of frailty and dementia, both of which introduce the need for strategies to address personal safety, poor self-management capacity, changing glycaemic goals, a higher likelihood of hospitalisation and institutionalisation, and reduced life expectancy. The final category relates to end of life care, focusing on interventions to manage symptoms, provide comfort and quality of life at this often difficult but important phase (IDF, 2014).

Reablement

The principles underpinning the reablement model of community health and social care align with those in the 2014 IDF Global Guideline, most closely in the focus on multi-disciplinary, whole-of-person, individualised care planning and on education and emotional support for both the older person and their caregiver (Cochrane, 2013; Glendinning, 2010). Also known as 'restorative care' in Australia, New Zealand and the United States, reablement comprises non-pharmacological strategies and interventions, the purpose of which is to bring about positive physical and mental / emotional health outcomes so that older people are able to (re)gain a level of independence in ADL and have an acceptable (to them) quality of life. Reablement also aims to reduce rates of morbidity and mortality, and to stabilise public health expenditure through reducing the need for long-term home care (Cochrane, 2013; Glendinning, 2010). Typically, reablement interventions are delivered as an intensive (multiple visits), duration-specific (commonly between six and twelve weeks), multi-disciplinary home care service that may include physical exercise and mobility support, education about nutrition, lifestyle and self-management of chronic conditions, adaptation and / or redesign within the home, the provision of assistive devices, and strategies to help manage anxiety and depression in the adult with diabetes and the family caregiver (Cochrane, 2013; Glendinning, 2010; Ryburn, 2009).

Because diabetes can be an extremely variable condition, a reablement model for this sub-population needs to be tailored to complement highly individualised and regular comprehensive assessment of the individual as a whole. The approach needs to be realistic about the person's ability to live independently or with services in the context of their age, degree of disability and functional status, while recognising that one's quality of life is variable and deeply personal, so that even small gains can make a large difference (Sinclair, 2015b). While outcome indicators from the body of literature around self-management of diabetes (not specific to older people) are largely positive, researchers note the adverse impact on an individual's capacity for self-care caused by significant levels of frailty and cognitive deficit (Hunt, 2005), conditions which are more likely to be present in older people with diabetes than in younger people with the disease.

Frailty

Frailty warrants particular attention in the context of this discussion. The increasing effect of type 2 diabetes on age-related functional capacity necessitates a clear focus on the detection and amelioration of frailty (Sinclair, 2015a). Frailty is considered to be a pre-disability biological syndrome that has a higher reversibility

in its early stages than disability, and a higher predictive value for adverse outcomes at older age than a chronic disease (Rodriguez-Mañas, 2014; Sinclair, 2015a). A range of factors are present in a frail older person, causing compromised health and functionality. These include impaired mobility, instability (risk of falling), cognitive decline, incontinence, and adverse effects of medical treatment (Fried, 2001; Sinclair, 2005; van Leeuwen, 2015). A state of frailty can be exacerbated by physical and environmental risk factors and stressors, causing susceptibility to infection, further disability and difficulty in re-establishing equilibrium after a disruptive event such as hospitalisation (Dubuc, 2013; Fairhall, 2013; van Leeuwen, 2015; Wallace, 2012). The prevalence of frailty increases with age, and it is the most common cause of death in community-dwelling older people through the cumulative effect of a number of health deficits (Rodriguez-Mañas, 2014; Song, 2010).

Importantly in the reablement context, researchers have concluded that frailty among older people is a dynamic process, characterised by frequent transitions between degrees of frailty over time, and as a result there are opportunities for therapeutic interventions to promote prevention or amelioration of the syndrome (Gill, 2006). Transitions between levels of frailty occur in 10 to 12% of cases wherein older people experience a reversal of their frailty state, with evidence of functional loss followed by a return to relatively robust function—although the probability of transitioning to a non-frail state is very low (de Rekeneire, 2015; Gill, 2006; Sinclair, 2015b). It is widely recognised that frailty impacts on all aspects of an individual's health—physical, mental and emotional—and in so doing detracts from their self-rated well-being and quality of life.

Quality of Life

Characterised by the presence of functionality, pain, energy, prevailing mood and social connectivity, quality of life is a significant determinant of how any individual, irrespective of their age, accepts and lives with the diagnosis of diabetes (Myers, 2013; Prazeres, 2014). Evidence points to lower self-rated quality of life scores among people with diabetes than those who do not have the condition (Anderson, 2001). Scores are likely to be further lowered in older people with diabetes through the presence of co-morbidities. A large case controlled study of over 400 community-dwelling older adults with diabetes in Wales (UK) identified four major determinants of reduced health status using the SF36 (both physical and mental domains), which were: hospitalisation, hypoglycaemic episodes, insulin therapy, and the need for glucose self-monitoring (Sinclair, 1998). Researchers have noted that older people with diabetes consider quality of life as being more important than the length of their life, and those with a high self-rated quality of life are more likely to continue with health-promoting practices such as exercise, as well as comply with treatment (Dunning, 2005e; Forbes, 2005).

In light of this, relevant research findings from reablement interventions that address quality of life deficits among frail older people and those with cognitive decline are discussed in two separate categories: firstly, physical health and safety; and secondly, mental and emotional health. This delineation is simply for the sake of clarity, for in practice reablement reflects the profound inter-connectedness of physical, mental and emotional health and its overall influence upon the individual's quality of life. For example, the multi-faceted benefits of physical exercise and activity interventions demonstrate increased mobility and improved balance by developing muscle strength and fitness as well as enhanced mental and emotional health in older adults in general, and in people with diabetes (Miller, 2013; Myers, 2013). Overall, these gains seem to enhance one's quality of life through reducing the incidence of falls, slowing age-related mobility loss and promoting both physical and emotional well-being (Brandon, 2003; Hovanec, 2012; Myers, 2013).

Physical Health and Safety

Maintaining the Ability to Self-Care

The reablement goal of self-management of chronic conditions reflects a global shift towards self-care in older people, increasingly viewed in many countries as an effective way to reduce health service use and costs (Furler, 2008). The term ‘self-management’ in this context may refer both to the daily self-care tasks associated with the diagnosed condition as well as to preventive activities that relatively healthy people do at home. In a Cochrane intervention review in 2015 of personalised care planning for adults with chronic illness, which included adults with diabetes in 12 out of a total of 19 selected studies (not specifically older adults), small positive outcomes were reported in people’s capacity to self-manage their illness and some improvements in both physical and psychological health indicators. The researchers associated these findings with comprehensive and intensive whole-of-person care (Coulter, 2015).

However, self-management can be challenging for many older adults with diabetes. Since the onset of both type 1 and type 2 diabetes in older people can be insidious and difficult to diagnose with symptoms that may be confused with the “normal ageing” process (Ghosh, 2006; IDF, 2015), older people are often quite unwell by the time their disease is confirmed and less able to cope with the diagnosis and with managing the necessary care tasks for survival and good health (Dunning, 2005a; IDF, 2015; Sinclair, 2000). Education is essential for optimising the ability to maintain self-care, and the IDF 2014 Global Guideline recommends that it be provided to both the older person with diabetes and their caregiver, with a focus on safety, risk management and complication prevention (IDF, 2014).

This approach is supported by evidence of the efficacy of self-management education for people with diabetes in the short-term and some positive indicators for long-term success, although studies of older people as a specific cohort are lacking (Norris, 2001). Research indicates that education programs in themselves can be successful in improving glycaemic control among middle-aged and older adults (Saaddine, 2006). Two small studies of education programs for people with diabetes and kidney disease (not restricted to older adults) reported apparent improvements in self-care and other positive behavioural changes, although investigators noted the need for more rigorous research to confirm these findings (Li, 2011). The education and training of staff are also essential in order to provide a flexible, multi-disciplinary approach within which health and social care professionals who have direct patient contact can learn new skills and competencies in functional assessment and in the delivery of newer interventions (Sinclair, 2015b).

Assistive technologies to support adults with diabetes in managing their condition at home are showing promise. Relatively simple, user-driven devices, such as the personal medical phone which transmits information like blood glucose levels and blood pressure to the treatment team, facilitate timely interventions and offer reassurance to the person with diabetes and their caregiver (Boger, 2011; Stellefson, 2013). While not exclusively focusing on older people with diabetes, a 12-month study of 445 United States veterans living at home who used a telehealth messaging system to co-ordinate their diabetes treatment revealed a significant reduction in their need for formal care, with concomitant cost savings (Barnett, 2006; Chumbler, 2005). Studies of older adults who use e-communication tools to manage their diabetes report user satisfaction and a higher self-rated ability for self-management, when backed up by feedback and support received remotely from health care providers—although few studies of this technology report statistically significant improvements in medication compliance or physical and cognitive health improvements (Pal, 2013), and the non-customisable design of many e-communication tools are thought to limit their usefulness (Stellefson, 2013).

Exercise and Activity

Long-term diabetes increases the risk of frailty through sarcopaenia and lower limb impairment, in addition to nutritional imbalance and risk of disability caused by undetected eye, skin tissue and kidney disorders (Sinclair, 2015b). These factors increase physical risks such as falling and other injury events which are prevalent in older people with diabetes, who have close to a three-fold risk of falling and a two-fold increase in injury resulting from a fall (Brandon, 2003; Maurer, 2005; Sinclair, 2005, 2008; Yau, 2013). Reablement interventions to reduce these risks reveal some positive outcome indicators. Strength training is shown to

protect against age-related muscle decline in older adults, and randomised trials of exercise programs for older adults with diabetes demonstrate clear evidence of increased strength and mobility (Lambers, 2008; Sinclair, 2008). A small clinical trial in Australia of a low-intensity, low-impact exercise program (tai chi) found modestly significant improvements in mobility, promoting better balance and gait (Orr, 2006). Studies of frail older people measuring accomplishments in activities of daily living (ADL) and mobility through physical exercise training found statistically significant improvements at 12 months post-intervention (Cameron, 2013; Francis, 2011).

An American review of falls prevention programs for community-dwelling older adults concluded that exercise is effective in reducing falls if it consists of strength plus balance and/or endurance training for at least 12 weeks, results which are enhanced when combined with regular medication and visual acuity assessment and environmental modification to reduce hazards (Costello, 2008). This finding supports clinical evidence of the efficacy of combined tailored exercise and falls prevention programs within the framework of regular and comprehensive geriatric assessment (Sinclair, 2008).

Other safety reablement interventions to have been trialled among frail older people and older people with dementia include telephone healthcare services and computerised personal devices, 'easy-reach' or computerised falls or gas detection systems, and customisable alarms that sound when the person with dementia exits the home or gets out of bed at night. These interventions are shown to reduce the risk of falls, boost confidence and self-esteem through independent achievement of ADL goals, and alleviate caregiver anxiety (Boger, 2011; MacNamara, 2012; Mihailidis, 2012; Ryburn, 2009; Wey, 2005).

There is also some evidence to suggest that physical exercise programs—comprising resistance / strength training and aerobic exercise or a combination of the two—can promote glycaemic control, although studies focusing on older adults with diabetes are scarce, and research has yet to clearly demonstrate the long-term effect of exercise programs (Irvine, 2009; Lambers, 2008; Vadstrup, 2009).

Weight Loss and Nutrition

A study of middle-aged and older adults with diabetes who participated in an intensive physical exercise intervention found evidence of weight loss, improved fitness and a slowing of mobility decline (Rejeski, 2012). It should be noted that such robust interventions may be unsuitable for some older people with diabetes if, for example, they are at risk of hypoglycemia (in those treated with insulin or a sulfonylurea), exacerbation of existing cardiovascular symptoms, or worsening of foot ulcers which require rest rather than exercise for healing to take place (Katz, 1994). In addition, weight loss can be difficult for older people to achieve if they have a sedentary lifestyle and existing co-morbidities (Dunning, 2005b; Katz, 1994).

Many older people with diabetes are malnourished, even if they appear to be overweight. The protein and fat breakdown caused by impaired glucose metabolism can significantly affect wound healing, which requires an increased amount of protein in the diet (Dunning, 2005b; Sinclair, 2015a). Education of the older person with diabetes and their caregiver about nutrition centres on a diet which helps stabilise and control blood glucose levels. While dietary modification is shown to improve control of diabetes and prevent diabetes in those with impaired glucose tolerance, there is no strong evidence at present to support its effectiveness in maintaining glycaemic control or in preventing complications of the disease (Vadstrup, 2009).

Older adults living at home have a high prevalence of uncorrected visual impairment. Diabetes itself can cause visual impairment, with increased cataract formation and the development of diabetic eye disease (retinopathy), which if untreated can lead to blindness and is linked to adverse health-related quality of life indicators (Sinclair, 2000a). There is some evidence to suggest that, in addition to regular screening for eye disease, maintaining good blood glucose control through dietary modification and regular exercise can contain or even reverse diabetic retinopathy (IAPB, 2015).

Foot Ulcers

There is a highly complex relationship between cause, treatment and prevention of lower limb ulceration among older people with diabetes. Factors influencing the incidence and outcomes of foot ulcers in this sub-population include the individual's level of understanding of this long-term complication, the presence or absence of good general and foot self-care with regular assessments, the challenges of long treatment periods, increased debility and reduced mobility all of which impact on self-care, and the necessary support in regaining function following surgery, including major or minor amputation.

Foot ulcers cause multi-faceted loss—physical, emotional and financial—with amputation being the most feared and the most costly outcome, occurring between 10 to 30 times more frequently in people with diabetes than in the general population (Singh, 2005). The Eurodiale (European Study Group on Diabetes and the Lower Extremity) Study of 1088 patients with new diabetic foot ulcers receiving treatment in 10 countries across Europe (not exclusively older adults) noted an association between poor wound healing rates and low health-related quality of life indicators (Siersma, 2014). Results from a 12-month prospective randomised controlled trial of rural Australians with chronic lower leg ulcers using remote expert wound healing consultation through an imaging system (again, not exclusively older people) indicated a positive healing rate of 6.9% per week in the intervention group compared with a -4.9% rate per week in the control group, with an estimated cost saving after 12 months of close to AUD200,000. Despite the small sample size and other limitations to this study, researchers concluded that there was a significant correlation between this intervention and better healing rates, improved quality of life and lower clinical costs (Santamaria, 2004).

However, it is recognised that older people with co-morbidities such as cognitive impairment and physical disabilities can experience difficulty in self-managing their foot care and in recognising symptoms of deterioration (Sinclair, 2011), and consequently the best protection rests in regular screening, foot care education and multi-disciplinary foot clinics (Sinclair, 2000b).

Mental and Emotional Health

Diabetes doubles the odds of co-morbid depression and is associated with both a higher rate and risk of cognitive decline. The odds of people with diabetes developing dementia increases 1.6 fold, creating risks to physical and emotional health through the diminishing ability of the individual to self-manage their diabetes and to retain control over their life (Allena, 2004; Anderson, 2001; Cukierman, 2005; Dunning, 2005c; Ghosh, 2006; Munshi, 2006; Myers, 2013; Sinclair, 2000c).

Research into cognitive training reablement strategies for older people with dementia has found statistically significant positive results for particular measures of cognition as well as for improved achievement of individual goals (Bahar-Fuchs, 2013; Clare, 2011; Thom, 2011), although findings remain inconclusive for cognitive ability enhancement through regular physical exercise and for the sustainability of cognitive improvements (Heyn, 2004; Serdà i Ferrer, 2014; Teri, 2012). Some researchers assert that outcomes for personal and social gains through cognitive training are inconclusive (Clare, 2010, 2013; Martin, 2011), while others detect positive indicators in reducing high-risk factors for institutionalisation, such as depression, behavioural volatility and the caregiver burden (Teri, 2012).

Assistive technologies are also being trialled in devices to enable or support communication, socialising and leisure activities for older people with cognitive impairment, drawing on the 'cognitive reserve' through which individuals can access their procedural memories, especially in the earlier stages of dementia (Liberati, 2012). This enables therapeutic interventions to help prolong the capacity for undertaking ADL and leisure pursuits which rely on previously encountered skills, routines, activities and communication (Clare, 2013; Gitlin, 2010). Positive outcome indicators have been noted in reablement interventions for older people with

cognitive impairment through assistive technology-facilitated leisure activities, ranging from art and music therapy to cooking and video games. Aside from important gains in emotional satisfaction and increased well-being, the mental stimulation of engaging in such activities is associated with a reduction in the risk of dementia and a slowing of cognitive decline (Mihailidis, 2010, 2012).

Even though more than 25% of older people with diabetes have symptoms of depression and mood disturbances, regular screening for depression and other mood disorders is rare (Sinclair, 2015a; Dunning, 2005e). It is beyond the scope of this paper to explore the complexity of factors causing depression in older people with diabetes. However, researchers note evidence for a connection between depression and disability and a decreased ability to self-manage diabetes well (Black, 2003; Dunning, 2005e). One study found depression to be the most significant determinant of hospitalisation and of subsequent mortality for older people with diabetes (Sinclair, 2000b). Improved mood and well-being for frail older adults through reablement interventions promoting social connectivity is modestly supported by current research (Francis, 2011).

Caregiver Education and Support

Research into reablement for frail older people and those who care for them shows that when caregivers are educated about the condition and consulted in care planning, implementation and evaluation of progress their levels of stress and anxiety reduce and their health and well-being may improve, along with their increased engagement with the reablement program (Elliott, 2010; Janse, 2014). These are significant findings for the care of older adults with diabetes, as caregivers have a pivotal role in maintaining whole-of-person care of the older adult with diabetes and in delaying hospitalisation or institutionalisation (Nankervis, 2015).

Positive outcomes from reablement interventions targeting the caregivers of older people with dementia include improvements in caregiver health and well-being through such strategies as in-home exercise programs, skills-training in managing behavioural symptoms, and education about the disease (Maslow, 2012; Menne, 2014). In a longitudinal study of racially and ethnically diverse informal caregivers in the USA, subjects reported improved sleep patterns, higher self-rated physical and emotional health status, a decreased sense of burden and some alleviation of depression (Elliott, 2010). Evidence also suggests that multi-component non-pharmacological interventions founded on education and support for the caregiver may delay transfer of the person with dementia to long-term residential care (Gitlin, 2010).

The Cost-Effectiveness of Reablement

Diabetes costs individuals and society a great deal. Costs to the individual, aside from direct treatment expenses, comprise physical and emotional suffering which profoundly affect their quality of life (Dunning, 2005a; Sinclair, 2000b).

The expenditure associated with the treatment and care of people with diabetes around the world is extremely high, as noted earlier in this paper. There is little clear evidence at present to suggest that reablement interventions for frail older people and those with cognitive dysfunction reduce medical and allied healthcare costs among older people with dementia, although researchers note compensatory benefits in statistically significant quality of life improvements, both for the person with dementia and for the caregiver (Clare, 2010; Liberati, 2012). Similarly, there is no reliable evidence as present that reablement has a material impact on the need for health services or hospitalisation of older frail people—although it is probable that improvements in mobility and physical functioning may delay or avoid hospitalisation through a reduced incidence of falls and other injuries (Francis, 2011).

Key Challenges of Reablement for Older People with Diabetes

- The inequity in services resulting from variations in clinical practice, seen within and between countries, leaves many older adults with diabetes at risk of morbidity, disability and poor quality of life if they lack access to adequate support and education, regular assessments of health status and screening for early detection of long-term complications.
- There is a critical dearth of evidence of successful and cost-effective reablement interventions for older adults with diabetes, caused in part by the frequent exclusion of older people from research trials on the grounds of difficulty with reliable data collection and ethics approval challenges.
- Diabetes can be an important cause of physical impairment in older people and may be associated with mobility disability, ADL restriction, increased risk of falls, and loss of independence.
- Diabetes is associated with both a higher rate and risk of cognitive decline leading to dementia, causing serious risks to physical health and safety, and emotional health.
- Depression and other mood disorders are commonly unrecognised due to lack of regular assessment, despite the high incidence in this sub-population and the correlation between depression and poor self-management of their diabetes, hospitalisation, morbidity and mortality.
- People with diabetes are living longer and therefore the incidence of frailty in this group is increasing. As a pre-disability biological syndrome, frailty has a high predictive value for adverse outcomes at an older age, causing compromised health and functionality and low self-rated quality of life. Frailty can also be difficult to define and identify, since a range of factors can be present in a frail older person.
- Because diabetes can be an extremely variable condition, a reablement model for this sub-population needs to be highly individualised, requiring time- and labour-intensive collaboration among service providers who often work in a time-pressured environment.

A Way Forward

Three target areas are indicated in addressing the challenge of inequitable service provision: at the level of the individual older person with diabetes; at the level of health care pathways or systems, which would include the reablement model; and at the level of influencing health care policy through research outcomes (Sinclair, 2015b). High quality, robust research is needed to enable better standardised care. Recommended priority areas for intervention trials are: examining the benefits of optimising glycaemic control using a range of outcome measures such as quality of life, frailty, dementia, mood level, pre-disability and disability and hospital admission; feasibility / pilot assessment of assistive technologies as treatment aids and decision support tools; and the cost-effectiveness of reablement interventions (Sinclair, 2015a). Some of these research issues are being addressed by the MID-Frail Study, an European Union-funded randomised controlled clinical trial currently underway in seven countries comprising a multi-modal intervention assessing the functional outcomes of treatment, exercise and education programs in 1800 frail or pre-frail people with type 2 diabetes over the age of 70 (Sinclair, 2015a). Other important gaps in the research are pre-study assessments of cognition, low mood states, ability to self-manage and the involvement of informal caregivers (Sinclair, 2013).

Further research is also needed into community health strategies that can prevent older people with impaired glucose tolerance from developing diabetes. Up to 80% of type 2 diabetes is preventable through strategies that reablement currently employs in the care of older people, such as changes in lifestyle, nutrition, exercise and activity and the individual's environment (Heine, 2002; IDF, 2015). Evidence from 21 randomised controlled trials indicates that lifestyle interventions and medical treatments can reduce the number of people who progress from impaired glucose tolerance to diabetes (Saaddine, 2006). It is suggested that lifestyle interventions are more effective than drug treatments in achieving this goal (Gillies, 2007), indicating that reablement in older people can make a substantially positive contribution to halting the ever-increasing global prevalence of type 2 diabetes.



Copenhagen
2016 Summit
INTERNATIONAL FEDERATION ON AGEING

This paper was prepared by Ms Vyvyan Mishra with contributions from Dr David Cavan and Professor Alan Sinclair

01 August 2015

REFERENCES

For 'Key Facts about Diabetes in an Ageing Society' section:

- Allena KV, Frier BM and Strachan MWJ (2004). The Relationship between Type 2 Diabetes and Cognitive Dysfunction: Longitudinal studies and their methodological limitations. *European Journal of Pharmacology* 490(1-3): 169-175.
- Chiles NS, Caroline L, Phillips CL, Volpato S et al (2014). Diabetes, Peripheral Neuropathy, and Lower-extremity Function. *Journal of Diabetes and its Complications* 28(1): 91–95. Italy.
- Cukierman T, Gerstein HC and Williamson JD (2005). Cognitive Decline and Dementia in Diabetes—Systematic overview of prospective observational studies. *Diabetologia* 48: 2460–2469.
- Dunning T (2005a). Introduction to Diabetes in Older People (Ch.1). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Ghosh K and Sinclair AJ (2006). Diabetes in Older People: Defining the issues and evidence-based management strategies (Editorial). *Aging Health* 2(2): 171-174. UK.
- International Diabetes Federation (2015). IDF Diabetes Atlas Sixth Edition Update. www.idf.org/ Accessed 31 May 2015.
- International Diabetes Federation (2014). Global Guideline for Managing Older People with Type 2 Diabetes.
- Lubitz J, Cai L, Kramarow E and Lentzner H (2003). Health, Life Expectancy, and Health Care Spending among the Elderly. *The New England Journal of Medicine* 349:1048-1055. USA.
- Maurer MS, Burcham J and Cheng H (2005). Diabetes Mellitus is Associated with an Increased Risk of Falls in Elderly Residents of a Long-Term Care Facility. *The Journals of Gerontology* 60(9): 1157-1162. USA.
- Sinclair A, Dunning T and Rodriguez-Mañas L (2015a). Diabetes in Older People: New insights and remaining challenges. *The Lancet* 3(4): 275-285.
- Sinclair AJ (2015b). Interview. 02 July 2015.
- Sinclair AJ (2000b). Diabetes in Old Age—Changing concepts in the secondary care arena. *Journal of the Royal College of Physicians of London* 34(3): 240-244.
- Weiss CO (2011). Frailty and Chronic Diseases in Older Adults. *Clinics in Geriatric Medicine* 27(1): 39-52.

For 'Key Challenges of Reablement for Older People with Diabetes' section:

- Allena KV, Frier BM and Strachan MWJ (2004). The Relationship between Type 2 Diabetes and Cognitive Dysfunction: Longitudinal studies and their methodological limitations. *European Journal of Pharmacology* 490(1-3): 169-175.
- Black SA, Markides KS and Ray LA (2003). Depression Predicts Increased Incidence of Adverse Health Outcomes in Older Mexican Americans with Type 2 Diabetes. *Diabetes Care* 26(10): 2822-2828. USA.
- Cukierman T, Gerstein HC and Williamson JD (2005). Cognitive Decline and Dementia in Diabetes—Systematic overview of prospective observational studies. *Diabetologia* 48: 2460–2469.
- Dunning T (2005c). Educating and Communicating with Older People (Ch.6). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Dunning T and Robins M (2005e). Mental Health, Depression, Dementia and Diabetes (Ch.8). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Fairhall NJ, Sherrington C and Cameron ID (2013). Mobility Training for Increasing Mobility and Functioning in Older People with Frailty (Protocol). *Cochrane Database of Systematic Reviews* 5.
- Forbes A (2005). Developing Care Systems for Older People (Ch.3). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Ghosh K and Sinclair AJ (2006). Diabetes in Older People: Defining the issues and evidence-based management strategies (Editorial). *Aging Health* 2(2): 171-174. UK.

- Heyn P, Abreu BC and Ottenbacher KJ (2004). The Effects of Exercise Training on Elderly Persons with Cognitive Impairment and Dementia: A meta-analysis. *Archives of Physical Medicine and Rehabilitation* 85:1694–1704.
- Munshi M, Grande L, Hayes M et al (2006). Cognitive Dysfunction is Associated with Poor Diabetes Control in Older Adults. *Diabetes Care* 29(8): 1794-1799. USA.
- Nankervis A (2015). Interview with Associate Professor Alison Nankervis, Clinical Head, Diabetes, Department of Diabetes and Endocrinology, Royal Melbourne Hospital, Victoria, Australia. 29 April 2015.
- Sinclair A, Dunning T and Rodriguez-Mañas L (2015a). Diabetes in Older People: New insights and remaining challenges. *The Lancet* 3(4): 275-285.
- Sinclair AJ (2015b). Interview. 02 July 2015.
- Sinclair AJ, Paolisso G, Castro M et al (2011). European Diabetes Working Party for Older People 2011 Clinical Guidelines for Type 2 Diabetes Mellitus. Executive Summary. A Report of the European Diabetes Working Party for Older People (EDWPOP) Revision Group on Clinical Practice Guidelines for Type 2 Diabetes Mellitus. *Diabetes and Metabolism* 37(3): S27-S38.
- Sinclair AJ (2000b). Diabetes in Old Age—Changing concepts in the secondary care arena. *Journal of the Royal College of Physicians of London* 34(3): 240-244.
- Sinclair AJ, Girling AJ and Bayer AJ (2000c). Cognitive Dysfunction in Older Subjects with Diabetes Mellitus: Impact on diabetes self-management and use of care services. *Diabetes Research and Clinical Practice* 50(3): 203-212.
-
- Allena KV, Frier BM and Strachan MWJ (2004). The Relationship between Type 2 Diabetes and Cognitive Dysfunction: Longitudinal studies and their methodological limitations. *European Journal of Pharmacology* 490(1-3): 169-175.
- Anderson RJ, Freedland KE, Clouse RE and Lustman PJ (2001). The Prevalence of Comorbid Depression in Adults with Diabetes: A meta-analysis. *Diabetes Care* 24(6): 1069–78.
- Bahar-Fuchs A, Clare L and Woods B (2013). Cognitive Training and Cognitive Rehabilitation for Mild to Moderate Alzheimer's Disease and Vascular Dementia. *The Cochrane Library*.
- Barnett TE, Chumbler NR, Vogel WB et al (2006). The Effectiveness of a Care Coordination Home Telehealth Program for Veterans with Diabetes Mellitus: A 2-year follow-up. *The American Journal of Managed Care* 12(8): 467–474. USA.
- Bergin SM, Alford JB, Allard BP, Gurr JM et al (2012). A Limb Lost Every 3 Hours: Can Australia reduce amputations in people with diabetes? Queensland University of Technology QUT ePrints.
- Black SA, Markides KS and Ray LA (2003). Depression Predicts Increased Incidence of Adverse Health Outcomes in Older Mexican Americans with Type 2 Diabetes. *Diabetes Care* 26(10): 2822-2828. USA.
- Boger J and Mihailidis A (2011). The Future of Intelligent Assistive Technologies for Cognition: Devices under development to support independent living and aging-with-choice. *NeuroRehabilitation* 28(3):271-280. Canada.
- Boisen E, Bygholm A, Cavan D and Hejlesen OK (2003). Copability, Coping, and Learning as Focal Concepts in the Evaluation of Computerised Diabetes Disease Management. *International Journal of Medical Informatics* 70(2-3): 353-363.
- Boyle JP, Thompson TJ, Gregg EW et al (2010). Projection of the Year 2050 Burden of Diabetes in the US Adult Population: Dynamic modeling of incidence, mortality, and prediabetes prevalence. *Population Health Metrics* 8(29). USA.
- Brandon LJ, Gaasch DA, Boyette LW and Lloyd AM (2003). Effects of Long-Term Resistive Training on Mobility and Strength in Older Adults with Diabetes. *The Journals of Gerontology* 58(8): M740–M745. USA.
- California Healthcare Foundation/American Geriatrics Society Panel in Improving Care for Elders with Diabetes (2003). Guidelines for Improving the Care of the Older Person with Diabetes Mellitus. *Journal of the American Geriatrics Society* 51(5): 265–280.
- Cameron ID, Fairhall N, Langron C et al (2013). A Multifactorial Interdisciplinary Intervention Reduces Frailty in Older People: Randomized trial. *BMC Medicine* 11(65). Denmark.

- Castaneda C, Layne JE, Munoz-Orians L et al (2002). A Randomized Controlled Trial of Resistance Exercise Training to Improve Glycemic Control in Older Adults with Type 2 Diabetes. *Diabetes Care* 25(12): 2335-2341. USA.
- Chiles NS, Caroline L, Phillips CL, Volpato S et al (2014). Diabetes, Peripheral Neuropathy, and Lower-extremity Function. *Journal of Diabetes and its Complications* 28(1): 91–95. Italy.
- Chodosh J, Morton SC, Mojica W et al (2005). Meta-Analysis: Chronic disease self-management programs for older adults. *Annals of Internal Medicine* 143(6): 427-438.
- Chumbler NR, Neugaard B, Kobb R et al (2005). Evaluation of a Care Coordination/Home-Telehealth Program for Veterans with Diabetes Health Services Utilization and Health-Related Quality of Life. *Evaluation & the Health Professions* 28(4): 464-478. USA.
- Clare L, Bayer A, Burns A et al (2013). Goal-oriented Cognitive Rehabilitation in Early-Stage Dementia: Study protocol for a multi-centre single-blind randomised controlled trial (GREAT). *Trials Journal* 14:152. UK.
- Clare L, Evans SJ, Parkinson CH et al (2011). Goal Setting in Cognitive Rehabilitation for People with Early Stage Alzheimer's Disease. *Clinical Gerontologist* 34(3): 220-236. UK.
- Clare L, Linden DEJ, Woods RT et al (2010). Goal-oriented Cognitive Rehabilitation for People with Early-Stage Alzheimer Disease: A single-blind randomized controlled trial of clinical efficacy. *The American Journal of Geriatric Psychiatry* 18(10): 928-939. UK.
- Cochrane A, McGilloway S, Furlong M et al (2013). Home-care 'Re-ablement' Services for Maintaining and Improving Older Adults' Functional Independence (Protocol). *Cochrane Database of Systematic Reviews* 11.
- Costello E and Edelstein JE (2008). Update on Falls Prevention for Community-Dwelling Older Adults: Review of single and multifactorial intervention programs. *Journal of Rehabilitation Research & Development* 45(8): 1135-1152.
- Coulter A, Entwistle VA, Eccles A et al (2015). Personalised Care Planning for Adults with Chronic or Long-Term Health Conditions: Intervention review. *Cochrane Database of Systematic Reviews* 3. Article No. CD010523.
- Cukierman T, Gerstein HC and Williamson JD (2005). Cognitive Decline and Dementia in Diabetes—Systematic overview of prospective observational studies. *Diabetologia* 48: 2460–2469.
- de Rekeneire N and Volpato S (2015). Physical Function and Disability in Older Adults with Diabetes. *Clinics in Geriatric Medicine* 31(1): 51–65.
- Dubuc N, Bonin L, Tourigny A et al (2013). Development of Integrated Care Pathways: Toward a care management system to meet the needs of frail and disabled community-dwelling older people. *International Journal of Integrated Care* 13: e017. Canada.
- Dunning T (2005a). Introduction to Diabetes in Older People (Ch.1). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Dunning T (2005b). Managing Diabetes in Older People (Ch.2). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Dunning T (2005c). Educating and Communicating with Older People (Ch.6). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Dunning T (2005d). Rehabilitation, Respite and Palliative Care (Ch.7). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Dunning T and Robins M (2005e). Mental Health, Depression, Dementia and Diabetes (Ch.8). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- Elliott AF, Burgio LD and DeCoster J (2010). Enhancing Caregiver Health: Findings from the resources for enhancing Alzheimer's caregiver Health II intervention. *Journal of the American Geriatrics Society* 58(1):30-37. USA.
- Fairhall NJ, Sherrington C and Cameron ID (2013). Mobility Training for Increasing Mobility and Functioning in Older People with Frailty (Protocol). *Cochrane Database of Systematic Reviews* 5.
- Forbes A (2005). Developing Care Systems for Older People (Ch.3). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.

- Francis J, Fisher M and Rutter D (2011). Reablement: A cost effective route to better outcomes. *SCIE Research Briefing* 36. UK.
- Fried LP, Tangen CM, Walston J et al (2001). Frailty in Older Adults: Evidence for a phenotype. *Journal of Gerontology* 56A(3): M146-M156.
- Funnell MM and Anderson RM (2004). Empowerment and Self-Management of Diabetes. *Clinical Diabetes* 22(3): 123-127. USA.
- Furler J, Walker C, Blackberry I et al (2008). The Emotional Context of Self-Management in Chronic Illness: A qualitative study of the role of health professional support in the self-management of type 2 diabetes. *BMC Health Services Research* 8:214. Australia.
- Ghosh K and Sinclair AJ (2006). Diabetes in Older People: Defining the issues and evidence-based management strategies (Editorial). *Aging Health* 2(2): 171-174. UK.
- Gill TM, Gahbauer EA, Allore HG and Han L (2006). Transitions Between Frailty States Among Community-Living Older Persons. *The Journal of the American Medical Association [JAMA] Internal Medicine* 166(4): 418-423. USA.
- Gillies CL, Abrams KR, Lambert PC et al (2007). Pharmacological and Lifestyle Interventions to Prevent or Delay Type 2 Diabetes in People with Impaired Glucose Tolerance: Systematic review and meta-analysis. *British Medical Journal* (online).
- Gitlin LN and Earland TV (2010). Dementia (Improving Quality of Life in Individuals with Dementia: The role of nonpharmacologic approaches in rehabilitation). In Stone JH and Blouin M [eds], *International Encyclopedia of Rehabilitation*.
- Glasgow RE, Toobert DJ and Gillette CD (2001). Psychosocial Barriers to Diabetes Self-management and Quality of Life. *Diabetes Spectrum* 14(1): 33-41.
- Glendinning C, Jones K, Baxter K et al (2010). Home Care Re-ablement Services: Investigating the longer-term impacts (prospective longitudinal study). UK: University of York.
- Glendinning C and Newbrunner E (2008). The Effectiveness of Home Care Reablement—Developing the evidence base. *Journal of Integrated Care* 16(4): 32-39. UK.
- Gregg EW, Chen H, Wagenknecht LE et al (2012). Association of an Intensive Lifestyle Intervention with Remission of Type 2 Diabetes. *The Journal of the American Medical Association [JAMA]* 308(23): 2489-2496. USA.
- Healy GN, Wijndaele K, Dunstan DW et al (2008). Objectively Measured Sedentary Time, Physical Activity, and Metabolic Risk. The Australian diabetes, obesity and lifestyle study (AusDiab). *Diabetes Care* 31(2): 369-371.
- Heine C and Browning CJ (2002). Communication and Psychosocial Consequences of Sensory Loss in Older Adults: Overview and rehabilitation directions. *Disability and Rehabilitation* 24(15): 763-773.
- Heyn P, Abreu BC and Ottenbacher KJ (2004). The Effects of Exercise Training on Elderly Persons with Cognitive Impairment and Dementia: A meta-analysis. *Archives of Physical Medicine and Rehabilitation* 85:1694-1704.
- Horowitz A, Reinhardt JP and Boerner K (2005). The Effect of Rehabilitation on Depression among Visually Disabled Older Adults. *Aging & Mental Health* 11: 551-557. USA.
- Hovanec N, Sawant A, Overend TJ et al (2012). Resistance Training and Older Adults with Type 2 Diabetes Mellitus: Strength of the evidence. *Journal of Aging Research*. Article ID 284635. Canada.
- Hunt S (2005). Effective Medication Management in Older People (Ch.9). In Dunning T [ed]. *Nursing Care of Older People with Diabetes*. Blackwell Publishing Ltd. Australia.
- International Agency for the Prevention of Blindness (IAPB). Diabetic Retinopathy: An Overview. www.iapb.org/vision-2020/what-is-avoidable-blindness/diabetic-retinopathy Accessed 14 June 2015.
- International Diabetes Federation (2015). IDF Diabetes Atlas Sixth Edition Update. www.idf.org/ Accessed 31 May 2015.
- International Diabetes Federation (2014). Global Guideline for Managing Older People with Type 2 Diabetes.
- Irvine C and Taylor NF (2009). Progressive Resistance Exercise Improves Glycaemic Control in People with Type 2 Diabetes Mellitus: A systematic review. *Australian Journal of Physiotherapy* 55: 237-246.

- Janse B, Huijsman R, de Kuyper RDM and Fabbricotti IN (2014). The Effects of an Integrated Care Intervention for the Frail Elderly on Informal Caregivers: A quasi-experimental study. *BMC Geriatrics* 14:58. The Netherlands.
- Katz MS and Lowenthal DT (1994). Influences of Age and Exercise on Glucose Metabolism: Implications for management of older diabetics. *Southern Medical Journal* 87(5): S70-S73.
- Lambers S, Van Laethem C, Van Acker K and Calders P (2008). Influence of Combined Exercise Training on Indices of Obesity, Diabetes and Cardiovascular Risk in Type 2 Diabetes Patients. *Clinical Rehabilitation* 22(6): 483–492. Belgium and Holland.
- Lewin G and Vandermeulen S (2010). A Non-Randomised Controlled Trial of the Home Independence Program (HIP): An Australian restorative programme for older home-care clients. *Health and Social Care in the Community* 18(1): 91–99.
- Li T, Wu HM, Wang F et al (2011). Education Programmes for People with Diabetic Kidney Disease. *Cochrane Database of Systematic Reviews* 6. Article No. CD007374.
- Liberati G, Raffone A and Belardinelli MO (2012). Cognitive Reserve and its Implications for Rehabilitation and Alzheimer's Disease. *Cognitive Processing* 13(1): 1-12.
- Lubitz J, Cai L, Kramarow E and Lentzner H (2003). Health, Life Expectancy, and Health Care Spending among the Elderly. *The New England Journal of Medicine* 349:1048-1055. USA.
- MacNamara GF (2012). Reshaping Care for Frail Older People in Scotland: An outcomes-focused evaluation of telehealthcare services in Falkirk. PhD thesis.
- Martin M, Clare L, Altgassen AM et al (2011). Cognition-based Interventions for Healthy Older People and People with Mild Cognitive Impairment. *The Cochrane Library*.
- Maslow K (2012). Translating Innovation to Impact: Evidence-based interventions to support people with Alzheimer's disease and their caregivers at home and in the community. Alliance for Ageing Research (Government White Paper). USA.
- Maurer MS, Burcham J and Cheng H (2005). Diabetes Mellitus is Associated with an Increased Risk of Falls in Elderly Residents of a Long-Term Care Facility. *The Journals of Gerontology* 60(9): 1157-1162. USA.
- Meneilly GS, Cheung E, Tessier D et al (1993). The Effect of Improved Glycemic Control on Cognitive Functions in the Elderly Patient with Diabetes. *The Journals of Gerontology* 48(4): M117-M121. Canada.
- Menne HL, Bass DM, Johnson JD et al (2014). Statewide Implementation of "Reducing Disability in Alzheimer's Disease": Impact on family caregiver outcomes. *Journal of Gerontological Social Work* 57(6-7): 626-639. USA.
- Mihailidis A, Boger J, Czarnuch S et al (2012). Ambient Assisted Living Technology to Support Older Adults with Dementia with Activities of Daily Living: Key concepts and the state of the art. *Handbook of Ambient Assisted Living*: 304-330.
- Mihailidis A, Blunsden S, Boger J et al (2010). Towards the Development of a Technology for Art Therapy and Dementia: Definition of needs and design constraints. *The Arts in Psychotherapy* 37(4): 293-300. Canada.
- Miller E (2013). Embedding Outcomes in the Reablement Model in North Lanarkshire. University of Strathclyde, Scotland.
- Munshi M, Grande L, Hayes M et al (2006). Cognitive Dysfunction is Associated with Poor Diabetes Control in Older Adults. *Diabetes Care* 29(8): 1794-1799. USA.
- Myers VH, McVay MA, Brashear MM et al (2013). Exercise Training and Quality of Life in Individuals with Type 2 Diabetes: A randomized controlled trial. *Diabetes Care* 36(7): 1884-1890. USA.
- Nankervis A (2015). Interview with Associate Professor Alison Nankervis, Clinical Head, Diabetes, Department of Diabetes and Endocrinology, Royal Melbourne Hospital, Victoria, Australia. 29 April 2015.
- New PW and Poulos CJ (2008). Functional Improvement of the Australian Health Care System—Can rehabilitation assist? *Medical Journal of Australia* 189(6): 340-343.
- Norris SL, Lau J, Jay Smith S et al (2002). Self-Management Education for Adults with Type 2 Diabetes. A meta-analysis of the effect on glycemic control. *Diabetes Care* 25(7): 1159-1171.

Norris SL, Engelgau MM and Venkat Narayan KM (2001). Effectiveness of Self-Management Training in Type 2 Diabetes. A systematic review of randomized controlled trials. *Diabetes Care* 24(3): 561-587.

Orr R, Tsang T, Lam P et al (2006). Mobility Impairment in Type 2 Diabetes: Association with muscle power and effect of tai chi intervention. *Diabetes Care* 29(9): 2120-2122. Australia.

Pal K, Eastwood SV, Michie S et al (2013). Computer-based Diabetes Self-management Interventions for Adults with Type 2 Diabetes Mellitus. *Cochrane Database of Systematic Reviews* 3. Article No. CD008776.

Pornet C, Bourdel-Marchasson I, Lecomte P et al (2011). Trends in the Quality of Care for Elderly People with Type 2 Diabetes: The need for improvements in safety and quality (the 2001 and 2007 ENTRED Surveys). *Diabetes & Metabolism* 37(2): 152-161. France.

Poulos C (2014). Making Sense of Reablement and Restorative Care: The HammondCare approach. HammondCare and UNSW. Australia.

Prazeres F and Figueiredo D (2014). Measuring Quality of Life of Old Type 2 Diabetic Patients in Primary Care in Portugal: A cross-sectional study. *Journal of Diabetes & Metabolic Disorders* 13:68.

Rejeski WJ, Edward H, Bertoni AG et al (2012). Lifestyle Change and Mobility in Obese Adults with Type 2 Diabetes. *The New England Journal of Medicine* 366: 1209-1217. USA.

Rodriguez-Mañas L and Fried LP (2014). Frailty in the Clinical Scenario. *The Lancet* 385: e7-e9.

Ryburn B, Wells Y and Foreman P (2009). Enabling Independence: Restorative approaches to home care provision for frail older adults. *Health and Social Care in the Community* 17(3): 225-234.

Saaddine JB, Cadwell B, Gregg EW et al (2006). Improvements in Diabetes Processes of Care and Intermediate Outcomes: United States, 1988–2002. *Annals of Internal Medicine* 144(7): 465-474.

Santamaria N, Carville K, Ellis I and Prentic J (2004). The Effectiveness of Digital Imaging and Remote Expert Wound Consultation on Healing Rates in Chronic Lower Leg Ulcers in the Kimberley Region of Western Australia. *Primary Intention* 12(2): 62-70.

Schillinger D, Grumbach K, Piette J et al (2002). Association of Health Literacy with Diabetes Outcomes. *The Journal of the American Medical Association [JAMA]* 288(4): 475-482. USA.

Serdà i Ferrer B-C and del Valle A (2014). A Rehabilitation Program for Alzheimer's Disease. *Journal of Nursing Research* 22(3): 192–199. Spain.

Siersma V, Thorsen H, Holstein PE et al (2014). Health-Related Quality of Life Predicts Major Amputation and Death, But Not Healing, in People with Diabetes Presenting with Foot Ulcers: The Eurodiale study. *Diabetes Care* 37(3): 694-700.

Sinclair A, Dunning T and Rodriguez-Mañas L (2015a). Diabetes in Older People: New insights and remaining challenges. *The Lancet* 3(4): 275-285.

Sinclair AJ (2015b). Interview. 02 July 2015.

Sinclair A and Morley J (2013). Frailty and Diabetes. *The Lancet* 382(9902): 1386–1387.

Sinclair AJ, Paolisso G, Castro M et al (2011). European Diabetes Working Party for Older People 2011 Clinical Guidelines for Type 2 Diabetes Mellitus. Executive Summary. A Report of the European Diabetes Working Party for Older People (EDWPOP) Revision Group on Clinical Practice Guidelines for Type 2 Diabetes Mellitus. *Diabetes and Metabolism* 37(3): S27-S38.

Sinclair AJ, Conroy SP and Bayer AJ (2008). Impact of Diabetes on Physical Function in Older People. *Diabetes Care* 31(2): 233-235.

Sinclair AJ (2006). Special Considerations in Older Adults with Diabetes: Meeting the challenge. *Diabetes Spectrum* 19(4): 229-233.

Sinclair AJ (2005). Diabetes Mellitus in Senior Citizens—A major threat to personal independence (Editorial). *The British Journal of Diabetes & Vascular Disease* 5:3-5.

- Sinclair AJ, Bayer AJ, Girling AJ and Woodhouse KW (2000a). Older Adults, Diabetes Mellitus and Visual Acuity: A community-based case-control study. *Age and Ageing* 29: 335-339. UK.
- Sinclair AJ (2000b). Diabetes in Old Age—Changing concepts in the secondary care arena. *Journal of the Royal College of Physicians of London* 34(3): 240-244.
- Sinclair AJ, Girling AJ and Bayer AJ (2000c). Cognitive Dysfunction in Older Subjects with Diabetes Mellitus: Impact on diabetes self-management and use of care services. *Diabetes Research and Clinical Practice* 50(3): 203-212.
- Sinclair AJ and Bayer AJ (1998). All Wales Research in Elderly (AWARE) Diabetes Study. London: Department of Health, UK (publ. no. 121/3040).
- Singh N, Armstrong DG and Lipsky BA (2005). Preventing Foot Ulcers in Patients with Diabetes. *The Journal of the American Medical Association [JAMA]* 293(2):217-228. USA.
- Song X, Mitnitski A and Rockwood K (2010). Prevalence and 10-Year Outcomes of Frailty in Older Adults in Relation to Deficit Accumulation. *Journal of the American Geriatrics Society* 58(4): 681-687. Canada.
- Speight J, Sinclair AJ, Browne JL et al (2013). Assessing the Impact of Diabetes on the Quality of Life of Older Adults Living in a Care Home: Validation of the ADDQoL Senior. *Diabetic Medicine* 30(1): 74-80. UK.
- Stellefson M, Chaney B, Barry AE et al (2013). Web 2.0 Chronic Disease Self-Management for Older Adults: A systematic review. *Journal of Medical Internet Research* 15(2): e35.
- Teri L, McKenzie G, Logsdon RG et al (2012). Translation of Two Evidence-Based Programs for Training Families to Improve Care of Persons with Dementia. *Gerontologist* 52(4): 452-459. USA.
- Thom J and Clare L (2011). Rationale for Combined Exercise and Cognition-Focused Interventions to Improve Functional Independence in People with Dementia. *Gerontology* 57(3): 265-75. UK.
- Vadstrup ES, Frølich A, Perrild H et al (2009). Lifestyle Intervention for Type 2 Diabetes Patients—Trial protocol of the Copenhagen Type 2 Diabetes Rehabilitation Project. *BMC Public Health* 9(166). Denmark.
- van Leeuwen KM (2015). Integrated Care and Quality of Life of Frail Older Adults: How can we measure what we aim to improve? PhD thesis. Denmark.
- Wallace C, Chandler L, Rogers A et al (2012). Caring for Frail Patients: Best practice. *Nursing Standard* 26(28): 50-56. UK.
- Weiss CO (2011). Frailty and Chronic Diseases in Older Adults. *Clinics in Geriatric Medicine* 27(1): 39-52.
- Wey S (2005). One Size Does Not Fit All: Person-centred approaches to the use of assistive technology (Ch.26). In Marshall M [ed]. *Perspectives on Rehabilitation and Dementia*. London & Philadelphia: Jessica Kingsley Publisher.
- Whitmer R (2008). Alzheimer's, Dementia and Diabetes—Where are the connections? *Diabetes Voice* 53(1): 19-22.
- Yau RK, Strotmeyer ES, Resnick HE et al (2013). Diabetes and Risk of Hospitalized Fall Injury Among Older Adults. *Diabetes Care* 36(12): 3985-3991. USA.