INTERNATIONAL DIABETES FEDERATION

MANAGING OLDER PEOPLE WITH TYPE 2 DIABETES

GLOBAL GUIDELINE

International Diabetes Federation

FOREWORD

This *Guideline* for managing type 2 diabetes mellitus was considered a necessary development following the launch of the IDF 2012 Global Guideline for Type 2 Diabetes. In the latter document, recommendations for managing diabetes in older people were included for the first time by the IDF but the review group felt that there were many areas where specific advice was still needed and indeed would offer the clinician extra value in decision making. It was also felt that the format of recommendations in the 2012 Guideline did not offer the flexibility required to address the special issues of older people and their varied physical, cognitive, and social needs.

We assembled an international group of diabetes experts to consider the key issues that require attention in supporting the highest quality of diabetes care for older people on a global scale. This *Guideline* is unique as it has been developed to provide the clinician with recommendations that assist in clinical management of a wide range of older adults such as those who are not only relatively well and active but those who are functionally dependent. This latter group has been categorized as those with frailty, or dementia, or those at the end of life. We have included practical advice on assessment measures that enable the clinician to categorize all older adults with diabetes and allow the appropriate and relevant recommendations to be applied.

This *Guideline* has been structured into main chapter headings dealing with expected areas such as cardiovascular risk, education, renal impairment, diabetic foot disease and so on, but also includes less commonly addressed areas such as seen such as sexual health. Also included is a section of 'special considerations' where areas such as pain and end of life care are addressed.

While there is increasing recognition that diabetes care for all people should be individualized it is apparent that for many older people with diabetes, care is sub-optimal and often fragmented leaving a substantial proportion of adults with unmet clinical and social need.

This *Guideline* has tried to address these shortfalls in diabetes care by listing a comprehensive set of recommendations that are as evidence-based as possible bearing in mind the relative lack of published data of clinical trials in older people with diabetes. We have also tried to ensure that wherever possible we have adhered to key principles of diabetes care laid down by the IDF and that our recommendations assist in enhancing health outcomes, raise the awareness of diabetes in ageing populations, prevent diabetes, and stop discrimination.

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Members of the Guidelines Working Group declared dualities of interest in respect of commercial enterprises, governments, and non-governmental organizations. No fees were paid to Working Group members in connexion with the current activity.

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INTRODUCTION AND BACKGROUND TO THE *GUIDELINE*

Population ageing is unprecedented, without parallel in the history of humanity. Increases in the proportions of older persons (60 years or older) are being accompanied by declines in the proportions of the young (under age 15) such that by 2050, the proportion of older persons will have risen from 15% today to 25%. These changes present significant challenges to welfare, pension, and healthcare systems in both developing and developed nations.

Globally, diabetes is being diagnosed in epidemic proportions and whilst the estimated diabetes prevalence for 2013 is 382 million it is expected to affect 592 million people by 2035. The five countries with the largest numbers of people with diabetes are China, India, the United States (US), Brazil and Mexico. The regions with the highest diabetes prevalence are the Pacific Islands and the Middle East. As type 2 diabetes is predominantly more prevalent in ageing populations, this creates a major public health burden.

It is not surprizing that these statistics are a cause for considerable concern for national healthcare systems and will create difficult and various challenges for providing focused and effective diabetes care to an ageing population. This problem is compounded by variations of diabetes care across different countries where there may be political, socioeconomic, and cultural factors that influence the quality and standards of care delivered.

The IDF accepts that an important limiting factor for producing specific evidence-based clinical guidelines for older people with diabetes is the need to extrapolate evidence from clinical studies in younger adults. The working group has considered this implication and has sought evidence from a wide range of studies that provide sufficient confidence for the basis of each recommendation. This limitation influenced our decision not to grade our recommendations at a particular level of evidence but we have, as given in the 2012 IDF Global Guideline, provided the rationale and key references for our recommendations in each chapter.

It is increasingly important that modern recommendations for managing diabetes are more closely-aligned with additional individual characteristics such as functional status, presence of frailty and dependency, comorbidity profiles, and life expectancy. These are likely to influence treatment goals, the care model adopted, and how the clinician plans on-going care. This is an imperative requirement for managing older people with diabetes and in this *Guideline* we have placed a strong emphasis on this approach. We have also recognized that a number of clinical areas in diabetes receive little or no attention in many published clinical guidelines. To allow for this, the working group has introduced recommendations on end of life care, management of pain, and falls.

This *Guideline* provides further support for clinicians by defining what physical and cognitive assessments can assist the clinician in making decisions about the functional status and comorbidity level of individuals being seen as a guide to treatment strategies adopted. Physicians predominately working with older people often combine this series of assessments into a management tool called a comprehensive geriatric assessment (CGA). This is coupled with advice on safe glucose lowering therapies, key aspects of patient safety, avoiding hospitalization and aged care home residency, and avoiding hypoglycaemia.

The provision of diabetes services for older people of minority ethnic groups in western societies has become increasingly important with numerous problems being identified such as poor access to services, lack of educational resources, poor follow-up practices and so on. The World Health Organization (WHO) emphasizes the importance of directing healthcare resources towards improving the quality of preventative care in primary care settings and to public health interventions that control diabetes rates.

The Guideline working group has recognized that informal carers (caregivers) are often the primary source of everyday advice, emotional support, and practical help for a large number of older people with diabetes. Their contribution is often overlooked by healthcare professionals involved in diabetes care and we have adopted this aspect of care as a key principle underpinning the *Guideline*.

Another important decision that the working group took was to develop this guideline to address treatment decisions in older people aged 70 years and over. We accept that the United Nations (UN) viewpoint is that people aged 60+ years are part of the older population and indeed might be more appropriate when the demographics of developing nations are considered. However, these definitions can be quite arbitrary and are compounded by the lack of correlation between chronological and biological age in different continents. We feel that a threshold of 70+ years ensures that people with diabetes will more likely to exhibit those characteristics that better determine how recommendations can be applied most appropriately. The Working Group accepts, however, that age thresholds for management can be an ad hoc viewpoint and that the clinician has the important responsibility to decide what clinical guideline is most appropriate for their older

patients by determining their functional status, level of medical comorbidities, and degree of frailty. This is an age threshold that usually signifies a change in social role and the emergence of changes in capability. These are important aspects to consider when planning diabetes care.

This *Guideline* also attempts to provide helpful information to providers of diabetes services on where to direct resources and what standards of diabetes care could be aimed for. However, the lack of well-designed studies on cost-effective diabetes care for older people prevents specific recommendations in this aspect of service development.

The IDF Working Group made the decision to focus and tailor this guideline on type 2 diabetes in older people. The principles of care, complications prevention and educational interventions, approaches to quality medicines management, assessment methodology, and metabolic targeting apply similarly to older people with type 1 diabetes but the Working Group acknowledges that type 1 has some additional specific issues.

We hope that this *Guideline* will assist diabetes services worldwide to move towards a consistent high quality provision of care. The recommendations are designed to support clinicians to provide a multidimensional integrated approach to the comprehensive management of diabetes in older people. It is also anticipated that these recommendations will support quality improvement activities and complement existing clinical guidelines such as the 2012 IDF Global Guideline.

It is intended that this *Guideline* be updated in 5 years.

02

RATIONALE FOR HIGH QUALITY DIABETES CARE FOR OLDER PEOPLE

The highly prevalent nature of diabetes in ageing populations is characterized by complexity of illness, an increased risk of medical comorbidities, and the early development of functional decline and risk of frailty. When these are coupled with the common and widespread occurrence of delayed diagnosis, frequent admission to hospital, and clinical care systems that may be sub-optimal, if not inadequate, it is not surprizing that the IDF now feels it is important to address these shortfalls by this *Guideline* which lays the foundation for high quality diabetes care for older people.

In this *Guideline* we provide the evidence base and recommendations for the treatment of glucose, blood pressure, and lipids in older people with diabetes. Whilst the evidence is increasing that blood pressure and lipid reduction also have specific benefits in older people above the age of 70 years, the evidence for tight glucose control is not available. Furthermore, recent studies are suggesting that a higher target glycated haemoglobin (HbA_{1c}) range may be more appropriate and safer.

Whilst the momentum for more clinical trials involving older subjects is to be encouraged, future studies specifically designed to include older people with diabetes must also ensure that a number of pre-trial assessments become routine such as cognition, mood status, self-management ability, or involvement of informal carers. Protocols for these clinical trials must also include measures of quality of life and health status. Other important patient related outcomes that should be included are hospitalization rates, changes in cognition and balance, falls rate, and other functional measures.

In many countries, healthcare policies have a focus on reducing health inequalities and providing greater evidence of equity of care. This is as important in diabetes as any other discipline and assumes greater priority in older people with diabetes where patient safety also assumes greater significance. At a population level, this is often measured by life expectancy and mortality rates. Within a clinical diabetes service, however, it is less clear how to assess this issue. What is important is that equitable diabetes care has to be measured at an individual clinician level, at the level of the organization the clinician works within, and at a regional or national level. At a practical level, clinicians and service management will need to promote equitable care and reduce inequality of diabetes care within their service by assessment of healthcare needs, measuring access to diabetes care services, and evaluating the quality of care delivered. In this *Guideline* we have produced recommendations and plans for their implementation that can act as an indication of quality of diabetes care delivered.

This *Guideline* has provided many examples of recommendations that are based on conclusive clinical trial evidence, e.g. in the areas of prevention, use of particular therapies, blood pressure and lipid regulation, and management of peripheral vascular disease and foot disorders. These provide additional reasons why good quality diabetes care is important in older people because they demonstrate similar benefits experienced by younger people from these interventions.

03

KEY PRINCIPLES UNDERPINNING THE *GUIDELINE*

Guiding principles were developed to describe the philosophy underpinning the Guidelines and encompass the need to consider functional status, individual needs, and the complex inter-relationships between diabetes and its comorbidities, other comorbidities, and life expectancy when planning and monitoring care for older people with diabetes.

The guiding principles include:

- An holistic, individualized care plan is needed for each older person with diabetes.
- It is important to adopt a proactive risk identification and minimization approach that includes planning for key transitions in older people such as stopping driving, moving to aged care homes, or supported community care and end of life care.
- A focus on patient safety, avoiding hospital/emergency department admissions and institutionalization by recognizing the deterioration early and maintaining independence and quality of life to a dignified death.
- Where possible, all therapeutic decisions should be based on:
    - Comprehensive assessment and risk stratification including assessing key risks common in older people: hypoglycaemia, hyperglycaemia and their consequences, falls, pain, medicine related adverse events.
    - Incorporating general health status in the assessment where relevant to the individual and their functional status.
    - Cost consideration and cost benefit analysis (if available).
    - An individualized risk stratification approach including functional status and other risk factors such as hypoglycaemia, falls, and pain.
    - Level of comorbid illness and/or frailty.
    - Life expectancy including when to implement palliative care.
- The principle of quality use of medicines including using non-medicine options first if possible, pharmacovigilance, and de-prescribing. Regular medicine reviews are essential especially before prescribing new medicines. The medicine review should encompass complementary medicine use.
- Practical guidance about managing older people with diabetes should be available to support clinicians to make decisions including decision support aids, policies, and documented referral processes.
- Educational support should be available for families/caregivers and for healthcare professionals and other carers.
- Older people from minority ethnic populations are likely to have specific education and care needs.
- Locally relevant interdisciplinary diabetes care pathways should be developed within the healthcare system.
- The quality of the care provided should be audited on a regular basis and the outcomes of the audits used to revise care.

04

FUNCTIONAL CATEGORIES OF OLDER PEOPLE WITH DIABETES

Several publications have described the spectrum of comorbid illness and functional impairment in ageing populations[1-3]. They emphasize a number of key features such as vulnerability to hypoglycaemia, recurrent hospitalization, and the emergence of cognitive dysfunction and frailty. Up to fairly recently, these characteristics have not been considered in the recommendations of clinical diabetes guidelines, and as such represented a gap in diabetes care.

The working group for this *Guideline* acknowledges that progress has been made in this area, and as part of an approach to individualizing therapy, a number of published guidelines[4-8] have highlighted the need to include factors such as life expectancy, duration of diabetes, risk of hypoglycaemia, and comorbidity profiles to determine how recommendations should be applied. There is still, however, a need to provide clinicians with greater guidance and clarity on how treatment decisions can be appropriately and safely applied to a wide range of older people with diabetes.

This *Guideline* is the first to consider specifically the presence of frailty in older people with diabetes which can be present in up to 25% of individuals [9]. Diabetes appears to be a risk factor for the development of frailty which is a pre-disability state and can lead to several important key adverse outcomes such as hospitalization, increased risk of a fall, and premature mortality[10]. Clinicians need to have greater familiarity with this associated complication of diabetes and several measures are available to evaluate its presence[11]. We have included guidance on evaluation of frailty and other functional aspects of assessment in *Chapter 5: Assessment and evaluation procedures for older people with diabetes* and below.

In recognition of this clinical need for well-defined categories of older people with diabetes to allow recommendations to be specific and suitable for the broad range of individuals seen in everyday clinical practice, the working group has developed three main categories for older individuals with diabetes as a basis for clinical decision-making. These are described below.

GENERAL

Many of the chapter recommendations in this *Guideline* provide general guidance in specific clinical areas where it is expected that certain minimum standards of care should apply irrespective of age, comorbid status, and presence of particular issues such as frailty or dementia. Additional recommendations have been included where we felt it important to specify a recommendation in the presence of varying levels of dependency.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

This category is characterized by people who are living independently, have no important impairments of activities of daily living (ADL), and who are receiving none or minimal caregiver support. Although diabetes may be the main medical problem, this category includes those who have other medical comorbidities which may influence diabetes care.

CATEGORY 2: FUNCTIONALLY DEPENDENT

This category represents those individuals who, due to loss of function, have impairments of ADL such as bathing, dressing, or personal care. This increases the likelihood of requiring additional medical and social care. Such individuals living in the community are at particular risk of admission to a care (nursing) home.

This category includes a range of functionally dependent older people with diabetes. Two groups require special consideration:

Subcategory A: Frail

These individuals are characterized by a combination of significant fatigue, recent weight loss, severe restriction in mobility and strength, increased propensity to falls, and increased risk of institutionalization. Frailty is a recognized condition and accounts for up to 25% of older people with diabetes. A Clinical Frailty Scale (see Table 1) is recommended to assist the clinician in identifying individuals in this sub-category. There is a small proportion of frail older people with diabetes who may be relatively independent but in time dependency develops.

Subcategory B: Dementia

Individuals in this sub-category have a degree of cognitive impairment that has led to significant memory problems, a degree

of disorientation, or a change in personality, and who now are unable to self-care. Many will be relatively physically well. Several cognitive screening tests are available to assist the clinician in identifying individuals in this sub-category (*see Table 1*).

Recommendations in both these sub-categories reflect the emphasis on patient safety, poor self-management ability, high risk of and susceptibility to hypoglycaemia and unacceptable hyperglycaemia and their consequences, changing glycaemic goals, higher risk of hospitalization, housebound or aged care home environment, and reduced life expectancy. Recommendations may include relaxing glycaemic goals, simplifying regimens, use of low-risk glucose lowering agents, providing family/patient education, and enhanced communication strategies.

CATEGORY 3: END OF LIFE CARE

These individuals are characterized by a significant medical illness or malignancy and have a life expectancy reduced to less than 1 year.

Recommendations reflect compromised self-care (fatigue, drowsiness from medicines), the need for pain relief, the important necessity for avoiding dehydration, withdrawal of treatment, and a raised threshold for investigation. Goals of care are often very different from other categories. These individuals typically require significant healthcare input and specific diabetes care may not necessarily be the most important priority. However, diabetes care remains important to manage symptoms, comfort, and quality of life.

05

ASSESSMENT AND EVALUATION PROCEDURES FOR OLDER PEOPLE WITH DIABETES

Assessment of older people with diabetes should be a multidimensional and multidisciplinary process designed to collect information on medical, psychosocial and functional capabilities and how these may limit activities.

These data are important for:

- Organizing treatment plans.
- Arranging rehabilitative services where available.
- Conducting an annual review which should include a medicine review.
- Determining long-term care requirements.
- Planning end of life care.

The emphasis is on managing complexity and quality of life issues in older people. The assessment tests in Table 1 are designed to be routinely used in everyday clinical practice by nurses and doctors, require little training, and to be a basis for screening of functional deficits. It is not expected that most or all will be routinely undertaken but these tests should be considered as part of the annual assessment and when clinically indicated. As a minimum, the consultation should include enquiring about functional capacity and cognitive and mental health.

Table 1. Examples of assessment tools and procedures[12-21]*

Assessment domain	Examples of assessment tools and procedures	Comments
Gait, balance, and mobility	IDOP 3-steps package[21]	Easily adapted to guideline resource; contains information on assessing gait speed and balance ability
ADL and IADL	Barthel ADL and IADL	Universally used; minimal training required
Cognition	MiniCog or Montreal Cognitive Assessment Tool	Easy to use; good evidence as screening tools for cognitive impairment
Mood level	Geriatric Depression Score	Widespread use; little training required
Frailty measures	Clinical Frailty Scale or CHSA 9-point Scale	Can be used as a quick assessment for features of frailty
Hypoglycaemia risk	A comprehensive history to identify risk factors *(see Chapter 20-3: Hypoglycaemia)*	Requires a positive commitment to consider risk factors by the clinician
Self-care abilities	SCI-R	A 13-15 item self-completed questionnaire suitable for type 1 and type 2 diabetes
Nutritional assessment	MNA-SF tool or MUST Tool	Well validated tools in widespread use; minimal training required
Pain	Pain thermometer[22] M-RVBPI[23]	For people with diabetes who have moderate to severe cognitive/communication disorder; easy to use but full validity has not yet been established[22]

ADL	activities of daily living
CHSA	Community Health Status Assessment
IADL	instrumental activities of daily living
IDOP	Institute for Diabetes in Old People
MNA-SF	Mini Nutritional Assessment-Short Form
M-RVBPI	Modified Residents' Verbal Brief Pain Inventory
MUST	Malnutrition Universal Screening Tool
SCI-R	Self-Care Inventory Revised

* Tools or procedures vary from country to country.

The key purpose of these assessment tests is to identify one or more healthcare needs that can be addressed by clinician intervention. They require minimal training and their use is associated with additional nurse, therapist, or physician time. However, identifying early the need for mobility support, nutritional intervention, the presence of cognitive impairment, or increased support for diabetes self-care can be fundamentally important to each older person and may improve clinical outcome.

QUALITY USE OF MEDICINES STRATEGIES TO REDUCE THE RISK OF MEDICINE-RELATED ADVERSE EVENTS IN OLDER PEOPLE

Managing medicines in older people is complex. Older people are very individual, therefore there is a need to individualize the medication regimen to balance the imperative to control disease states with the imperative to avoid/minimize medicine related adverse events. Medicines are associated with significant risks in older people such as falls, confusion and other cognitive changes, and admission to hospital or emergency departments could be avoided if medicines are managed optimally.

Older people experience a disproportionate number of medicine related adverse events, even after adjusting for age and other demographic data; approximately 10% more than expected. The proportion of people over 75 years taking multiple medicines is double that of 50-64 year olds and medicine related hospital admissions are higher in people over 80 years. Medicines that account for most adverse events are warfarin, oral antiplatelet agents, insulin, alone or in combination, and analgesics. Thus, it is essential to adopt a quality use of medicines (QUM) approach to managing medicines in each older person which includes:

- Undertake a medicines adverse event risk assessment considering functional and cognitive status and factors such as renal and liver disease, autonomic neuropathy, and amount of support available; medicines that are contraindicated in older people or should be used with caution.
- Consider factors that contribute to medicine related adverse events:
  - Polypharmacy.
  - Inappropriate prescribing.
  - Not recognizing medicines as a contributing cause of signs and symptoms which can lead to a 'prescribing cascade' and compound the risks.
  - Presence of renal and/or liver disease.
  - Prescribed high risk medicines such as insulin, certain sulfonylureas and warfarin.
  - Living alone.
  - Cognitive and functional impairment.
  - Sensory deficits such as vision, hearing, and medicines self-management behaviours in self-caring older people.
- Undertake a comprehensive medicine review including complementary and over-the-counter medicines at the initial assessment then:
  - Before stopping a medicine or starting a new medicine.
  - At any change in health or functional status.
  - When new symptoms emerge: consider any new symptom as related to a medicine/s until proven otherwise.
  - If a medicine related adverse event occurs.
  - As part of the annual complication/health review.
  - When transitioning between care settings.
- Consider the medicine burden and reduce polypharmacy, the complexity of the dose regimen, and consider stopping medicines where possible and safe (deprescribing).
- Use the lowest effective dose, increase doses slowly, and monitor the effects including adverse effects.
- Anticipate difficulties adhering to the medicine regimen and consider whether alternative dose forms (e.g. swallowing difficulties, not all medicines can be crushed for administration), or packaging (e.g. 'Webster packs' but do not assume the packs are accurately packed with the correct medicines doses), are needed.
- Use the lowest possible range of medicine classes.
- Consider medicines lists such as the Beers Criteria and STOPP/START tools (*see below*).
- Use non-medicine options first if possible and safe e.g. massage and acupuncture for some forms of pain.
- Develop medicine management plans in consultation with the individual and/or their family/caregivers as part of the overall care plan.
- Ensure appropriate, personalized medicine education is available for the older person, their family/caregivers and that healthcare professionals managing medicines are appropriately qualified and competent.
- Ensure aged care homes and other care settings have medicine management policies and guidelines in place.
- Document the medicine list in a legible form (preferably not hand written) and communicate to the individual, their family/caregivers and other healthcare professionals involved in the individual's care.

Tools that can help clinicians make safe medicine choice with/for older people

- American Geriatrics Society Beers Criteria:
- http://www.americangeriatrics.org/files/documents/beers/2012BeersCriteria_JAGS.pdf
- STARTing and STOPPing Medications in the Elderly:
- *http://www.usafp.org/Word_PDF_Files/Annual-Meeting-2012-Syllabus/Spieker%20-%20New%20Drugs%20in%20Medicine%20Cabinet%20STOPP.PDF*
- Medication Appropriateness Index: *http://www.farm.ucl.ac.be/Full-texts-FARM/Spinewine-2006-2.pdf.*
- Australian Inappropriate Medication Use and Prescribing Indicators Tool: *www.ncbi.nlm.nih.gov/pubmed/18729548*

06

STRUCTURE OF CHAPTERS WITH RECOMMENDATIONS

The following chapter structure has been adopted:

- **Recommendations:**
  Specific recommendations are made for each of the functional categories detailed in *Chapter 4: Functional categories of older people with diabetes.*

General
Category 1: Functionally Independent
Category 2: Functionally Dependent:
Sub-category A: Frail
Sub-category B: Dementia
Category 3: End of Life Care

- **Rationale and Evidence Base:**
  Considers why the topic is important and provides a brief review of the evidence base predominantly from older populations of people with diabetes.
- **Implementation in Routine Clinical Practice:**
  Considers how the recommendations can be implemented in routine practice; how clinicians and the multidisciplinary diabetes team can acquire the necessary skills and competencies to care for older people with diabetes; how to improve access to services for older people; and how to support carers.
- **Evaluation and Clinical Audit Indicators:**
  Suggests how to evaluate the care of older people with diabetes, provides examples of data which could be collected in routine clinical practice, and gives examples of indicators which can be used to audit the recommendations.
- **Potential Indicator/s:**

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator

07

SCREENING, DIAGNOSIS, AND PREVENTION

RECOMMENDATIONS: SCREENING AND DIAGNOSIS

GENERAL

- All older people should be regularly tested for undiagnosed diabetes.
- All older people admitted to an aged care home should be tested for undiagnosed diabetes.
- Diabetes can be diagnosed on any of the following WHO criteria:
  - Fasting plasma glucose (FPG) ≥ 7.0 mmol/l (126 mg/dl) or,
  - 75 g oral glucose tolerance test (OGTT) with FPG ≥ 7.0 mmol/l (126 mg/dl) and/or 2 hour plasma glucose ≥ 11.1 mmol/l (200 mg/dl) or,
  - HbA_{1c} ≥ 6.5% /48 mmol/mol, or
  - Random plasma glucose ≥ 11.1 mmol/l (200 mg/dl) in the presence of classical diabetes symptoms.
- Asymptomatic individuals with a single abnormal test should have the test repeated to confirm the diagnosis unless the result is unequivocally elevated.
- Where a random plasma glucose level is ≥ 5.6 mmol/l (≥ 100 mg/dl) but < 11.1 mmol/l (< 200 mg/dl), an FPG, or an HbA1c should be measured, or an OGTT performed.
- Use of HbA_{1c} as a diagnostic test for diabetes requires stringent quality assurance tests to be in place and assays standardised to criteria aligned to the international reference values, and that there are no conditions present which preclude its accurate measurement.
- People with screen-detected diabetes should be offered treatment and care.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.
- Routine testing for undiagnosed diabetes should be performed at least every 3 years and more frequently if clinically indicated (e.g. individuals with impaired glucose tolerance^{IGT} and when an individual is admitted to an aged care home).

CATEGORY 2: FUNCTIONALLY DEPENDENT

Sub-category A: Frail

- Testing for undiagnosed diabetes should be performed when clinically indicated using simpler procedures.

Sub-category B: Dementia

- Testing for undiagnosed diabetes should be performed when clinically indicated using simpler procedures but especially when antipsychotic therapy is prescribed.

CATEGORY 3: END OF LIFE CARE

- Testing for undiagnosed diabetes should be performed using random glucose measurement when clinically indicated but especially when corticosteroids are prescribed.

RATIONALE AND EVIDENCE BASE

Diabetes is common in older people and is often undiagnosed. While undiagnosed, diabetes may produce symptoms, result in complications and aggravate existing comorbidities. Type 2 diabetes has a long asymptomatic preclinical phase which frequently goes undetected and complications are commonly present at the time of diagnosis. Although there is debate about screening and early detection of diabetes in the general population, it is usually favoured in older people because of its high prevalence and the potential negative impact on health.

Populations throughout the world consistently show an increase in prevalence of diagnosed and undiagnosed type 2 diabetes with increasing age, reaching a plateau or even declining slightly in the very old. For example, in Australia in the age group 25-34, 0.2% have diagnosed and 0.1% have undiagnosed diabetes, increasing respectively to 9.4% and 8.5% in 65-74 year olds and 10.9% and 12.1% for people aged 75 years and older[24]. In the US in the age groups 70-74, 75-79, 80-84, and ≥ 85 years the prevalence of diabetes was 20%, 21.1%, 20.2%, and 17.3%, respectively[25]. The DECODE Study analysed data from nine European countries and reported a prevalence of type 2 diabetes of < 10% in people age < 60 years and 10-20% in those aged 60-79 years[26]. The findings of the DECODA study in 11 Asian cohorts were similar[27].

The usual risk factors for undiagnosed diabetes also apply in older people, including increasing weight and ethnicity. Undiagnosed diabetes is particularly common in older people with acute myocardial infarction (34% in the Glucose Tolerance in Acute Myocardial Infarction study in people over 80 years of age)[28], and with cerebrovascular disease (46% with newly diagnosed diabetes of people with a mean age of 71 years with acute ischaemic stroke)[29]. Mental illness seems to be associated with an increase in type 2 diabetes[30] but data regarding antipsychotic medication varies with the strongest association reported for treatment with olanzapine in people with major psychiatric illness [31,32]. However it is difficult to differentiate the effect of the mental illness from its treatment[33].

Postprandial hyperglycaemia is common in older people[34]. Therefore older people are more likely to have a non-diabetic fasting plasma glucose and a diabetic 2 hour post-challenge glucose level[35]. This has implications for diagnosis and results in differences in prevalence depending on which diagnostic test is used[36]. In addition, a number of studies in older populations have demonstrated that isolated post-challenge hyperglycaemia is associated with adverse outcomes compared with normal glucose-tolerant individuals[37-39].

The implications for the individual require balancing the risks and benefits of performing an OGTT and the likelihood of missing significant hyperglycaemia. For example, an individual with a non-diabetic fasting plasma glucose and HbA_{1c} is unlikely to have clinically relevant hyperglycaemia. However, an OGTT may be clinically indicated in an older individual with equivocal results.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

There should be local protocols and guidelines for screening for undiagnosed diabetes and it should be routine for all older people admitted to an aged care home (*see Chapter 20-7: Diabetes in aged care homes*). Public awareness should be raised about undiagnosed diabetes in older people and this should be specifically discussed with family and caregivers. Similarly there should be healthcare professional education campaigns.

EVALUATION AND CLINICAL AUDIT INDICATORS

The existence of protocols for diabetes testing could be assessed. Testing for undiagnosed diabetes when older people are admitted to an aged care home should be regularly evaluated.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of newly admitted residents to aged care homes screened for diabetes	Number of newly admitted residents to aged care homes	Number of newly admitted residents to aged care homes who were screened for diabetes as a percentage of the total number of residents admitted to the aged care home	Screening documented in care plans and medical records

RECOMMENDATIONS: **PREVENTION**

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Consider offering a lifestyle change intervention programme to older people who are at high risk of developing diabetes, especially those with IGT, elevated fasting glucose, or HbA_{1c} between 6.1-6.4% / 43-46 mmol/mol.

CATEGORY 2: FUNCTIONALLY DEPENDENT

Sub-category A: Frail

- A tailored home-based lifestyle/exercise programme may assist to reduce the risk of diabetes in high risk individuals.
- Lifestyle changes should not include dietary changes which may result in weight loss.

Sub-category B: Dementia

- Any lifestyle changes should be tailored to allow for the high risk of lack of cooperation by the individual with dementia and the need for family and/or caregiver support.

CATEGORY 3: END OF LIFE CARE

- Interventions to prevent diabetes are unlikely to be relevant for those at end of life

RATIONALE AND EVIDENCE BASE

Screening for diabetes will also identify individuals with intermediate hyperglycaemia (IGT and impaired fasting glucose[IFG]) who may benefit from interventions to prevent or delay progression to diabetes, and to prevent cardiovascular disease (CVD) and other diabetes-specific complications.

The prevalence of IGT and IFG also increase with increasing age. For example in the NHANES III study[40] the prevalence of IGT increased from 11.1% in people aged 40-49 to 20.9% in those aged 60-74 years. IGT and IFG are important risk factors for the development of future diabetes and increase risk 10-20 fold compared with those with normal glucose tolerance. This increased risk does not seem to vary with age.

Several studies have shown that progression to diabetes can be prevented or delayed in people with IGT [41,42]. In the US Diabetes Prevention Program (DPP), lifestyle modification achieved a 58% reduction compared with a 31% reduction with metformin in progression to diabetes. The effect of lifestyle modification was greatest in people aged ≥ 60 years, whereas the effect of metformin was not significant in this age group[42]. Follow-up of the DPP cohort for 10 years showed that the group 60 years and over age group appeared to benefit more from the lifestyle intervention than younger participants, but did not appear to benefit from metformin (49% risk reduction in those aged > 60 years at randomization compared with 34% for the total cohort)[43] and additional benefits of the lifestyle intervention that might impact older adults, such as reduction in urinary incontinence[44] and improvement in quality of life[45].

The benefits of identifying IGT or IFG in older adults depend on the time taken to achieve benefit and the person's life expectancy. Although prevention studies suggest a benefit in relatively healthy older adults, these studies did not enrol significant numbers over the age of 70 years or those with functional or cognitive impairments.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Significant cooperation across all health and social care sectors in a locality is required to have an effective programme based around lifestyle modification and prevention of diabetes. Implementing primary care interventions are more likely to reach vulnerable groups including those who are housebound or residing in aged care homes.

EVALUATION AND CLINICAL AUDIT INDICATORS

The main requirements for evaluation will relate to the level and degree of investment by the healthcare organization for instituting a lifestyle, nutritional, and preventative programme for diabetes extending across all patient groups. This will include the extent of promoting exercise programmes, healthy eating and nutritional advice, and individualizing educational and management plans.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of functionally independent older people with IGT or IFG offered a lifestyle change intervention programme	Total number of functionally independent older people with IGT or IFG attending a practice or clinic	Number of functionally independent older people with IGT or IFG offered a lifestyle change intervention programme as a percentage of the total number of functionally independent older people with IGT or IFG attending a practice or clinic	Documentation of IGT or IFG and a lifestyle, change intervention programme

08

NUTRITION, PHYSICAL ACTIVITY, AND EXERCISE

RECOMMENDATIONS: **NUTRITION**

GENERAL

- All older people should have a nutritional and biochemical assessment at diagnosis, on admission to an aged care home, and as part of the annual review.
- The nutrition plan should be individualized and consider the person's food preferences, eating routines, religion and culture, and physical and cognitive health status.
- The meal plan should include a variety of foods to ensure essential vitamins, minerals, protein, and fibre are consumed in adequate amounts.
- Medicine administration times must coincide with meal times if the individual is on insulin or sulfonylureas to reduce the risk of hypoglycaemia.
- People with swallowing difficulties should be identified and referred to a speech therapist if available.
- All older people with diabetes should be considered for an annual seasonal influenza vaccination.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Functionally independent people with diabetes should be encouraged and assisted to achieve and maintain a healthy body weight.
- A consistent amount of carbohydrate should be provided at each meal.
- The meal plan can include sugar in moderate amounts but excess sugar, soft drinks and fruit juices should be avoided.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Encourage the consumption of adequate amounts of fluid to avoid dehydration especially in hot weather.
- Education and training are essential to enable healthcare professionals and caregivers to provide nutritional support.

Sub-category A: Frail

- The nutritional assessment should be used to identify the presence of malnutrition and/or weight loss and the appropriate nutritional plan to be adopted.
- Higher protein and higher energy intake foods may be needed to improve nutritional and functional status in frail older people with diabetes.

Sub-category B: Dementia

- Healthcare professionals and caregivers should identify actual and potential eating difficulties.
- Caregivers should provide support at mealtimes to ensure that agitation is managed and meals are consumed.

CATEGORY 3: END OF LIFE CARE

- Feeding tubes or intravenous (parenteral) nutrition may be needed to meet nutritional needs.
- The individual, family, and caregivers should be involved in decisions relating to nutritional support with respect of advance directive and ethical issues.

RECOMMENDATIONS: **PHYSICAL ACTIVITY AND EXERCISE**

GENERAL

- Older people with diabetes should be encouraged to be as active as their health and functional status allow.
- A risk assessment should be undertaken before recommending an activity programme.
- Timing and type of activity should be considered in relation to the medicine regimen, especially glucose lowering agents associated with an increased risk of hypoglycaemia.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Encourage functionally independent older people with diabetes to exercise to targets recommended for all adults with diabetes.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Encourage a low intensity home-based exercise programme to improve physical performance and maintain ADL and mobility.
- If available, a physiotherapist should be consulted to assist those who are housebound or confined to a bed or chair to undertake exercise to build arm and leg strength and flexibility.

Sub-category A: Frail

- Provide light-resistance and balance training to improve physical performance, lower limb strength, and prevent further deterioration in functional status.

Sub-category B: Dementia

- Educate family members and caregivers on the safest effective maintenance exercises that individuals can undertake.

CATEGORY 3: END OF LIFE CARE

- Encourage some form of exercise consistent with the person's capability and health status.

RATIONALE AND EVIDENCE BASE: NUTRITION

Nutrition is an important part of diabetes care for all age groups. However, there are important additional concerns for older adults with diabetes[46]. Malnutrition is common in older people, especially in aged care homes[47]. Malnutrition is associated with longer length of stay in hospital and increased mortality[48], is a strong predictor of readmission and is associated with pressure ulcers, delirium, and depression[49].

Concomitant diseases that increase the risk of malnutrition in older people with diabetes include:

- Gastroparesis, which is present in up to 25-55% of people with type 1 and 30% with type 2 diabetes[50] and may affect glucose stability and orally administered medicines absorption and may cause significant discomfort.
- Parkinson's disease.
- Psychiatric disorders and depression.
- Chronic obstructive pulmonary disease.
- Renal failure
- Neurological dysfunction.
- Dental disease.

Energy needs decline with age, but micronutrient needs remain similar throughout adulthood. Meeting micronutrient needs where there is lower energy intake can be challenging and older people often have micronutrient deficiencies and are at risk of under nutrition due to anorexia, altered taste and smell, swallowing difficulties, oral and dental issues, and functional impairments, which compromise their capacity to shop for, prepare, and eat a healthy, balanced diet[5], especially when they live alone and have financial difficulties. Food in aged care homes is rarely the same as the person is accustomed to.

Over restrictive eating patterns, either self-imposed or provider-directed can contribute additional nutritional risks for older people. Several specific nutrition assessment tools designed for older adults are available and can identify older people at risk. For example, the Mini Nutritional Assessment (MNA) and helps determine whether referral to a dietitian is needed[5]. Other tools include the Malnutrition Universal Screening Tool (MUST), the Simplified Nutritional Assessment Questionnaire (SNAQ), Subjective Global Assessment (SGA), and the Patient-Generated SGA (PG-SGA)[47]. Sometimes it is easier to assess malnutrition by measuring the mid-arm circumference, especially in frail older people.

Biochemical assessment may include electrolytes, serum transferrin, albumin, prealbumin, thyroid function tests, cholesterol, iron, vitamin B12, folate, and vitamin D. Hydration status can be assessed using the Hydration Assessment Checklist. Even mild dehydration can contribute to cognitive changes.

In addition, a medicine review may be required because some medicines affect vitamin B12 absorption (e.g. digitalis, metformin, and sedatives). Alcohol also affects the absorption of vitamin B12. Supplementary vitamins and minerals may be needed. Likewise, antihypertensive medications such as angiotensin converting enzyme (ACE)-inhibitors, angiotensin 2 receptor antagonists (ARB), and thiazide diuretics may cause a diverse range of disturbances in electrolyte homeostasis[51]. Food-medicine interactions should be considered as part of the structured medicine review.

When nutritional needs are not met by the person's usual food intake, the following strategies might help: encourage smaller more frequent meals, fortify usual foods, change food texture, or include liquid nutrition supplements between meals[5,52].

Some older people are overweight or obese. However the body mass index (BMI) is not an accurate predictor of the degree of adiposity in older people due to age related changes in body composition[53]. Obesity exacerbates the age related decline in physical function and increases the risk of frailty[54]. Intentional weight loss in overweight and obese older people can worsen bone mineral density and nutritional deficits[55]. Strategies that combine physical activity with nutritional therapy to promote weight loss may result in improved physical performance and function and reduced cardio-metabolic risk in older adults[54].

Age-related changes in the immune system increase the susceptibility of older people to bacterial and viral infections, and this is exacerbated by medical comorbidities such as diabetes, renal impairment, and multiple drug therapies. Although immune responses to antigens can be impaired with advancing age, all people in high-risk groups such as those with diabetes are recommended to receive a seasonal influenza vaccination as this has been associated with a reduction in complications, hospitalizations, and death[56]. In older people with diabetes, this may also be associated with reduced admissions to intensive care units and reduced hospitalization costs[57].

RATIONALE AND EVIDENCE BASE: PHYSICAL ACTIVITY AND EXERCISE

Exercise should be an integral component of the management of diabetes in older people and can be associated with benefits relating to mobility, balance, reduced falls risk, psycho-social benefits, and enhancing quality of life. Muscle mass and muscle strength decline with age and may be exacerbated by diabetes complications, other comorbidities, and periods of hospitalization. People with diabetes of longer duration and those with higher HbA_{1c} levels have lower muscle strength per unit of muscle mass than BMI and age matched people without diabetes and people with shorter duration of diabetes or who have better glycaemic control[58].

Although age and diabetes both reduce fitness and strength, physical activity improves functional status in older adults with and without diabetes[59]. Even light intensity physical activity is associated with higher self-rated physical health and psychosocial well-being[60]. Ways of facilitating increased physical activity and fitness include healthcare professional recommendation and encouragement, and referral to community supervised walking schemes, and community-based group exercise and fitness programmes where these are available.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Implementation requires healthcare and provider awareness and training and education of individuals with diabetes, family, and caregivers. Protocols are required for assessment and management and cooperation across health and social care sectors. Special attention is required for vulnerable groups including those who are housebound or residing in aged care homes.

EVALUATION AND CLINICAL AUDIT INDICATORS

Evaluation centres on assessing the existence of protocols, opportunities for healthcare and provider training, and identifying key audit indicators and procedures for collecting, reviewing, and acting on the data in all care environments.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes who have had a comprehensive annual nutritional assessment	Total number of older people with type 2 diabetes who are eligible for an annual comprehensive nutritional assessment	Number of older people with type 2 diabetes having an annual comprehensive nutritional as a percentage of the total number of people eligible for such an assessment	Documentation and date of the assessment
Percentage of older people with type 2 diabetes who have an exercise/dietary plan that is appropriate for their health status	Total number of older people with type 2 diabetes who are eligible to have an exercise/dietary plan	Number of older people with type 2 diabetes who have an exercise/dietary plan appropriate to their health status as a percentage of the total number of eligible people	Documentation and date of the most recent exercise/dietary plan

09

EDUCATION, DIABETES SELF-MANAGEMENT, AND SELF-MONITORING OF BLOOD GLUCOSE

RECOMMENDATIONS

GENERAL

- Education should be offered to all older people with diabetes with the teaching strategy and learning environment modified to suit the older person and/or their caregiver.
- Education should be individualized, include goal setting and focus on safety, risk management, and complication prevention.
- Older people with newly diagnosed diabetes (and/or their caregiver) should receive 'survival education' initially and then on-going education.
- Older people with established diabetes (and/or their caregiver) should receive regular education and review.
- Provide simple and individualized hypoglycaemia and sick day management plans.
- Appropriate decision aids and cues to action should be developed with the individual and their family carers.
- Consider an individualized blood glucose monitoring plan for people on insulin and some oral glucose lowering therapy.
- Monitoring of blood glucose could be considered for others as an optional component of self-management where there is an agreed purpose for testing.
- Monitoring of blood glucose should only be used within a care package, accompanied by structured education on how the results can be used to reinforce lifestyle change, adjust therapy, or alert healthcare professionals to changes.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- The focus should be on individualized self-management education with on-going review of self-care behaviours.
- Self-management is likely to include an individualized blood glucose monitoring plan.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Self-management education should take account of physical and mental functional impairments, comorbidities, vision, hearing, manual dexterity, and the social situation.
- Education should be provided to caregivers, both healthcare professional and unpaid.
- When used, blood glucose monitoring should be at a minimum level compatible with avoiding hypo- and hyperglycaemia.

Sub-category A: Frail

- As for *General* and specific *Category 2: Functionally Dependent* recommendations.

Sub-category B: Dementia

- Self-management education is often of limited relevance and education and support should be directed to family, informal, and formal caregivers.
- Where indicated, blood glucose monitoring would be undertaken by a family member, informal carer, or healthcare professional depending on the individual circumstances of the person.
- Hyperglycaemia is a special risk in people with dementia and can lead to a change in mental performance leading to a confusional state or delirium.

CATEGORY 3: END OF LIFE CARE

- Educational support should focus on reassurance and preventing acute complications of diabetes.
- The diabetes healthcare team should liaise closely with the family and other clinicians including palliative care and aged care home staff.
- The threshold for continuing blood glucose monitoring should high and only considered under special circumstances (e.g. commencement of corticosteroids) and where the danger of hypoglycaemia is particularly high (e.g. with significant nutritional problems).

RATIONALE AND EVIDENCE BASE

Older people and their caregivers do not often receive adequate diabetes education and many current education programmes do not suit the learning needs or learning styles of older people[61]. Self-management, education, and empowerment are fundamental cornerstones of diabetes management in all national and international diabetes guidelines with an emphasis on self-management (where appropriate), proficiency in certain care skills, and medicine management[8,62]. The importance of self-management in chronic disease and programmes delivered by healthcare professionals or by trained lay people has been promoted[63] and healthcare professionals have been encouraged to involve people in their care and decisions about their care plan[64]. Focussing on functional improvement and reduction of geriatric syndromes by better diabetes treatment has been shown to be a strong motivator[65].

The characteristics of older learners need to be considered when planning, delivering, and evaluating diabetes education. Older people:

- Have established beliefs, attitudes, problem-solving, and decision-making processes but these can be affected by hypo- and hyperglycaemia, dehydration, and cognitive changes.
- May have poor self-esteem and social, economic, and functional deficits that affect their capacity to participate in education.
- Often have a decline in short-term memory, word finding difficulty, poorer simple and complex motor performance, and slower reaction time (by ~ 20%), which affects information processing and decision making especially when complex decisions are required, the cue to action is weak and the motor sequence needed to complete a task is complex.
- May not regard diabetes as a priority in their lives.
- Often learn from personal experience and their peers but can learn in groups and also use multimedia education strategies.
- Learn best in an environment conducive to learning e.g. quiet, adequately lighted, accessible, comfortable, and that does not conflict with other activities[66].

Thus, healthcare professional educators need to adapt their teaching to take account of functional and cognitive impairments and learning style. International guidance in the area of education for Thus, healthcare professional educators need to adapt their teaching to take account of functional and cognitive impairments and learning style. International guidance in the area of education for family and caregivers of older people with diabetes and emphasises the importance of assessment of their abilities and competencies to undertake these roles[4].

A 2002 systematic review of 31 studies of self-management education for adults with type 2 diabetes examined the effect on glucose control[67] reported a reduction in HbA_{1c} of 0.76% / 8mmol/l compared with 0.26% / 3 mmol/mol in the control group after 1-3 months and by 0.26% / 3 mmol/mol at 4 months or more. HbA_{1c} reduction was greater with additional contact time between participant and educator. A systematic review and meta-analysis

on the effect of nurse-led diabetes self-management education on HbA_{1c} and cardiovascular risk factors published in 2012[68]) analysed 34 randomized controlled trial's with 5,993 subjects. Mean age was 52.8 years and mean HbA_{1c} at baseline was 8.5% / 69 mmol/mol. Mean HbA_{1c} reduction in the nurse led intervention was 0.7% / 8 mmol/mol versus a 0.21% / 2 mmol/mol reduction in the usual care group. Subgroup analyses showed a greater effect among older people (65 years and older) and with shorter follow-up of 1-6 months.

There is little evidence about self-monitoring of blood glucose (SMBG) specifically in older populations. The Cochrane review of SMBG in people with type 2 diabetes not using insulin[69] reviewed 12 randomized controlled trials that included 3,259 randomized subjects. Two of the studies had entry criteria of age up to 80 years. Most studies had a mean age of participants in the 45-58 years age range with three studies having a mean age of intervention participants in the range 60-65 years. The review concluded that when diabetes duration is over one year, the overall effect on reducing HbA_{1c} in non-insulin using people is small up to 6 months and subsides after 12 months. They also stated that there is no evidence that SMBG affects patient satisfaction, general well-being or general health related quality of life.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

As with all people with diabetes, diabetes self-management education/training for older adults should be individualized to the person's unique medical, cultural, and social situation. Additionally, for older adults, diabetes self-management training may need to account for possible impairments in sensation (vision, hearing), cognition, and functional/physical status. Care partners, family, friends, or other caregivers, should be involved to increase the likelihood of successful self-care behaviours[70].

There are well established teaching strategies for older people which include:

- Developing an individual teaching plan based on the individual's needs, status, and goals.
- Giving the option to have relatives/carers present.
- Providing an optimal learning environment.
- Ensuring they can get into and out of chairs easily, that any pain is managed, and that blood glucose is in an optimal range to avoid confusion associated with hypo- and hyperglycaemia.
- Proceeding from the simple to more complex, explaining concepts and linking to familiar things, and allowing people to practice skills.
- Using a variety of teaching strategies and repeating information in different ways.
- Seeking feedback and asking questions and above all listening.
- Providing handouts but making sure they are at a suitable literacy level, font size and style, colour contrast, and have enough white space to make them easy to read. Ideally such materials should be focus tested and/or subject to assessment such as the Suitability Assessment Method (SAM) before they are used [66,71].

There are a number of barriers to education of older people with diabetes. Alzheimer's-type and multi-infarct dementia are approximately twice as common in people with diabetes compared with age-matched non-diabetic subjects[72]. The presentation of cognitive dysfunction can vary from subtle executive dysfunction to overt dementia and memory loss. When communicating with cognitively impaired people, educators should address the person by name (even when a caregiver provides most care), speak in simple terms, use cues that aid memory (relevant verbal analogies, hands-on experience, demonstrations and models), and utilize strategies such as sequenced visits to build on information.

Sensory impairments should also be considered. Nearly one in five older United States adults with diabetes report visual impairment and hearing impairment involving both high- and low to mid-frequency sound is about twice as prevalent in people with diabetes and may be linked to both vascular disease and neuropathy.

A shared decision-making approach should be considered based on:

- Establishing an ongoing partnership between patient/caregiver and provider.
- Information exchange.
- Deliberation on choices.
- Deciding and acting on decisions [5].

When asked about their healthcare goals, older people with diabetes focus most on their functional status and independence[73] and this must be factored into shared decision making.

EVALUATION AND CLINICAL AUDIT INDICATORS

Evaluation should focus on the extent by which a healthcare organization delivering diabetes care for older people has invested time and resources to ensure that the educational and other support materials are 'fit for purpose'. This will include the extent of promoting individualized educational plans, making educational materials sensitive to the presence of conditions that influence learning such as visual health or other sensory impairments, and the appropriate use of SMBG.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes who have an individualized education plan	Total number of older people with type 2 diabetes who are eligible for an individualized plan	Number of older people with type 2 diabetes and an individualized education plan as a percentage of the total number of people eligible for such a plan	Documentation and date of the education plan

10

CARDIOVASCULAR RISK

Cardiovascular risk protection through the control of blood glucose, blood pressure, lipids, and lifestyle modification is dealt with in detail elsewhere in this *Guideline* (*see Chapter 11: Glucose control management and targets, Chapter 12: Blood pressure management, Chapter 13: Management of dyslipidaemia,* and *Chapter 8: Nutrition, physical activity, and exercise*).

RECOMMENDATIONS

GENERAL

- All people with diabetes aged 60+ years are considered at high cardiovascular risk and application of a risk equation is unnecessary.
- Individual risk factors which may influence management should be identified including current or previous CVD, atrial fibrillation, blood pressure, lipids, glycaemia, albuminuria, and smoking.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Modifiable individual cardiovascular risk factors should be treated as for younger people with diabetes.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- The emphasis should be on the identification and management of more easily modifiable risk factors.

Sub-category A: Frail

- The principles are as for *Category 2: Functionally Dependent.*

Sub-category B: Dementia

- Educate caregivers to support measures for cardiovascular risk protection.

CATEGORY 3: END OF LIFE CARE

- Specific assessment of cardiovascular risk is usually unnecessary.

RATIONALE AND EVIDENCE BASE

CVD is the major cause of mortality and morbidity in people diabetes [74]. With increasing age, the incidence of CVD increases exponentially. CVD is increased between two- and four-fold in people with diabetes. All people with diabetes aged 60 and over are at increased CVD risk and should be considered for CVD prevention measures. However since many interventions take a number of years to demonstrate benefit, their initiation may not be warranted in those with a limited life expectancy.

Assessment of cardiovascular risk in older people with diabetes is difficult as most risk assessment tools do not extrapolate beyond age 65. The Framingham risk score has been validated for people up to 75 years but has been shown to be unreliable in older persons[75]. This, coupled with the fact that the combined presence of diabetes and older age automatically place these people at high cardiovascular risk, means that risk assessment using predictive tools is unnecessary.

Established and potentially modifiable risk factors for CVD include:

- **Smoking:** Preventative measures for stopping smoking are effective up to an advanced age[76]. An accurate smoking history is vital when assessing CVD risk and every attempt should be made to encourage the person to stop smoking, irrespective of age.
- **Blood pressure:** The identification and control of an elevated blood pressure, particularly systolic blood pressure (SBP), had been shown in numerous studies, to mitigate the risk of CVD, especially stroke. Isolated systolic hypertension is a strong predictor of coronary artery disease in the elderly, and the frequency increases with age[77]. Target blood pressures remain uncertain[78,79] and are considered in a separate chapter (*see Chapter 12: Blood pressure management*).
- **Dyslipidaemia:** A full lipid profile, including total cholesterol, low density lipoprotein (LDL)-cholesterol, high density lipoprotein (HDL)-cholesterol and triglycerides should be assessed initially and then at clinically relevant intervals. While some studies have failed to demonstrate a direct association between serum cholesterol levels and cardiovascular risk in older people[80], the number of cardiovascular events prevented by instituting lipid lowering therapy in older people is greater than in younger people and therefore treatment for dyslipidaemia is indicated in older people (*see Chapter 13: Management of dyslipidaemia*).
- **Renal dysfunction:** Those with renal dysfunction, and particularly with albuminuria and microalbuminuria, are at significantly increased risk of CVD[81, 82]. The prevalence of increased urinary albumin excretion increases in an ageing population, often for reasons unrelated to diabetic nephropathy. Regular testing for albuminuria is part of the risk assessment.
- **Glycaemic control** is considered to be less important as a risk factor in the older age group. Improved glycaemic control appears to have minimal effect on CVD in the medium term[83,84] and can take up to 20 years to show a significant reduction in coronary artery disease outcomes[85]. The ACCORD study reported that attempts at aggressive improvement in glycaemic control increased mortality[86]. These considerations are relevant to glycaemic targets and are considered in elsewhere (*see Chapter 11: Glucose control management and targets*).
- **Depression** is much more common in people with diabetes than in their age-matched counterparts[87,88] and is frequently under diagnosed and undertreated in older people. Depression not only contributes to death and disability in its own right[89], but also is considered a significant independent risk factor for CVD[90] and worsens its prognosis. Identification of depression with the use of a short screening tool (*see Table 1*) may be useful in identifying these individuals.
- **Peripheral arterial disease:** The ankle-brachial index (ABI) is a simple way of detecting atherosclerotic disease and is a reliable marker of peripheral arterial disease[91]. A low ABI predicts of angina, myocardial infarction, congestive heart failure, and stroke, even in an older population.
- **Obstructive sleep apnoea** is associated with a 70% relative increased risk of CVD morbidity and mortality[92] and where clinically indicated and where facilities are available, it should be considered, identified, and treated appropriately.
- **Periodontitis** is an emerging risk factor for CVD[93]. Careful dental examination, or preferably referral to a dentist, should be considered as part of CVD risk assessment and protection.
- **Obesity** is considered a risk factor for CVD in young to middle aged individuals and has been linked to both morbidity and mortality. However, this may not be the case in older people, where increased weight may in fact prove protective. Weiss et al[94] demonstrated a reduction in mortality rates in hospitalized very elderly subjects with increased BMI. Monami et al[95], in a study on the metabolic syndrome and CVD mortality in older people, demonstrated that while the presence of the metabolic syndrome impacted on CVD mortality in people with type 2 diabetes up to the age of 70 years, this did not hold true for those over 70 years. Therefore, while weight, BMI, and waist circumference should be documented as part of overall risk assessment, the institution of weight loss programmes in older people should be carefully considered not only because of limited data with regard to improving outcomes, but also because of concerns about potential harms of weight reduction.
- **Socio-economic status**: Low socio-economic status in older people who are isolated or disconnected from others, increase risk of death from CVD.

IMPLEMENTATION IN ROUTINE

CLINICAL PRACTICE

Older people with diabetes should have access to appropriate healthcare professionals and multidisciplinary teams who are trained in recognizing issues related to high CVD risk. Healthcare professionals should have the ability to perform not only the necessary physical examination and clinical assessment, but should have access to laboratory facilities to monitor and document lipid profiles, HbA_{1c} and albuminuria. These need to be available in both the community and inpatient care facilities. Access to appropriate specialist care should be available when needed.

EVALUATION AND CLINICAL AUDIT INDICATORS

Older people should be included in audits and surveys, and their CVD risk assessed, and documented, particularly in those with a potential life expectancy in excess of 5-10 years.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes who have had a comprehensive cardiovascular risk assessment in the past year	Number of older people with type 2 diabetes who have been seen in the past year	Number of older people with type 2 diabetes who have had a comprehensive cardiovascular risk assessment in the past year as a percentage of older people who have been seen in the past year	Documentation and date of the most recent assessment

11

GLUCOSE CONTROL MANAGEMENT AND TARGETS

RECOMMENDATIONS

GENERAL

- Glycaemic control targets should be individualized taking into account functional status, comorbidities, especially the presence of established CVD, history and risk of hypoglycaemia, and presence of microvascular complications.
- Begin oral glucose lowering therapy when lifestyle interventions alone are unable to maintain target blood glucose levels.
- Maintain support for lifestyle measures throughout the use of these medicines.
- Discuss with the individual and principal caregiver care goals and medicine dose, regimen, and tablet burden before choosing glucose lowering agents.
- Use the "start low and go slow" principle in initiating and increasing medication and monitor response to each initiation or dose increase for up to a 3 month trial period.
- Consider discontinuing ineffective and unnecessary therapies.
- Consider the cost and the risk*-to-benefit ratio when choosing a medicine.
- *(*risk includes adverse event, hypoglycaemia, weight gain or weight loss, need for caregiver involvement, impact of worsening renal or hepatic function, gastro-intestinal symptoms).*

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- The usual HbA_{1c} target is 7.0-7.5% / 53-59 mmol/mol.

FIRST-LINE THERAPY

- Consider metformin as first-line therapy unless there is evidence of renal impairment or other contraindications. Titrate the dose over initial weeks to minimize gastrointestinal intolerance. Monitor renal function closely (estimated glomerular filtration rate [eGFR]* is more accurate than serum creatinine in older people).
- A sulfonylurea can be used if metformin is not tolerated or contraindicated. Use a sulfonylurea with a low risk of hypoglycaemia and avoid glyburide/glibenclamide.
- A dipeptidyl dipeptidase 4 (DPP-4) inhibitor may also be considered if available and affordable.
- Glinides may be considered in older people with postprandial hyperglycaemia and erratic eating habits but can interact with certain medications in older people (e.g. non-selective beta-blockers, salicylates, non-steroidal anti-inflammatory medications, macrolides, ACE-inhibitors).

* Calculation of eGFR in older individuals using the MDRD and CKD-EPI formulae have a similar performance[96] while the Cockroft Gault formula tends to underestimate eGFR.

SECOND-LINE THERAPY

- Add a sulfonylurea (with low risk of hypoglycaemia) to metformin if glycaemic targets are not achieved.
- Alternatively add a DPP-4 inhibitor.
- If oral glucose lowering agents are contraindicated or not tolerated, a long acting basal insulin is an alternate option.

THIRD-LINE THERAPY

- Options include:
  - Triple oral therapy.
  - Basal or pre-mixed insulin.
  - Glucagon-like peptide-1 receptor agonist (GLP-1 RA) - gastrointestinal side-effects may be problematic and weight loss can be detrimental in the frail, underweight older person.

SUBSEQUENT OPTIONS

- If on triple oral therapy options include:
  - Changing one of the oral glucose lowering agents to an agent of a different class.
  - Commencing basal or pre-mixed insulin.
  - Using a GLP-1 RA.
- Switching to or adding insulin if on a GLP-1 RA.
- Intensifying the insulin regimen if on insulin.

INSULIN THERAPY

- Do not delay the appropriate commencement of insulin.
- Begin with basal insulin once a day using long-acting insulin (NPH, glargine, or detemir), or once or twice daily premixed (biphasic) insulin.
- Use of pre-filled insulin pen devices may reduce dosage errors.
- Metformin is usually continued, if tolerated and not contraindicated.

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CATEGORY 2: FUNCTIONALLY DEPENDENT

- The usual HbA_{1c} target is 7.0-8.0% / 53-64 mmol/mol.
- The principles are as for *Category 1: Functionally Independent* but additional precautions are required.
- When prescribing an oral glucose lowering agent, choose one with a low potential for hypoglycaemia.
- Use simplified insulin regimens with a low hypoglycaemic risk.
- Avoid complex regimens and higher treatment burden to reduce the risk of medication errors.

Sub-category A: Frail

- An HbA_{1c} target up to 8.5% / 70 mmol/mol may be appropriate.
- Avoid or discontinue agents that might cause nausea or gastrointestinal disturbance or excess weight loss (e.g. metformin or a GLP-1 RA).
- Insulin may provide anabolic benefits.

Sub-category B: Dementia

- An HbA_{1c} target up to 8.5% / 70 mmol/mol may be appropriate.
- Caregivers and/or family should be educated to recognize the subtle indicators of hypoglycaemia.

CATEGORY 3: END OF LIFE CARE

- The glycaemic target is to avoid symptomatic hyperglycaemia.
- The same precautions as indicated for people in *Category 2: Functionally Dependent apply.*
- Minimize hypoglycaemia and symptomatic hyperglycaemia by appropriate individualized management
- Consider appropriate withdrawal of therapy, including insulin, during the terminal stage.

Table 2. General glycaemic targets according to functional category*

Functional category	General glycated haemoglobin target
Functionally Independent	7.0-7.5% / 53-59 mmol/mol
Functionally dependent	7.0-8.0% / 53-64 mmol/mol
• Frail	• Up to 8.5% / 70 mmol/mol
• Dementia	• Up to 8.5% / 70 mmol/mol
End of life	Avoid symptomatic hyperglycaemia

* Glycaemic targets should be individualized taking into account functional status, comorbidities, especially the presence of established CVD, history and risk of hypoglycaemia, and presence of microvascular complications.

RATIONALE AND EVIDENCE BASE

Safe and appropriate glucose lowering is important in older people with diabetes. The emphasis is on achieving glycaemic levels that prevent and minimize vascular complications of diabetes but also minimize the risk of hypoglycaemia. Modern diabetes care of older people with diabetes is based around individualized managed plans[97] tailored to the many characteristics described in this guidance that influence the choice of agent and glycaemic targets.

Prescribing therapy in older people requires additional knowledge of age-associated changes in pathophysiology, pharmacokinetics, and pharmacodynamics[98,99], use of multiple medicines, and drug to drug interactions and this adds to the challenges of managing diabetes in this older population. For example, drug metabolism in older people is affected by a decline in renal and hepatic functions, and lower lean body mass and pharmacodynamic changes manifest as increased sensitivity to medicines in older individuals. Identification of risk factors for hypoglycaemia is important in view of the high vulnerability of older people to this complication of therapy, particularly those with frailty, under-nutrition, or dementia. Often, traditional education programmes and treatment plans for diabetes do not take these factors into account.

Several guidelines and consensus papers are now available to help manage complex issues pertaining to diabetes management in older persons[4,7,8,100,101]. However, many expert-opinions based recommendations still need to be proven by large randomized trials.

Many classes of oral and injectable glucose lowering therapies are available for the treatment of diabetes[102-106]. Many national and international guidelines to improve care for older people with diabetes are based on current knowledge, local regulations, and availability of medicines. However, there is a common theme from these guidelines that can be translated in to a generic algorithm that can be adapted based on local issues in different parts of the world[4,7,8,102,105,107].

Generally, an oral glucose lowering agent is recommended when glycaemic goals are not achieved by lifestyle modifications after a period of 3 months. The choice of agents should be established in the context of clinical, functional, and psychosocial milieu, and taking into account local availability, prescribing regulations, and cost. The altered pharmacokinetics and pharmacodynamics associated with ageing require starting at lower doses and avoiding maximum doses of therapeutic agents. The relative contribution of postprandial glucose is higher compared with fasting glucose in older people and agents which preferentially lower post prandial

hyperglycaemia may be more effective in achieving glycaemic goals without increasing the risk of fasting hypoglycaemia. When any new medicine is started, response and possible side-effects to each medicine initiation or dose increase should be monitored. Ineffective therapies should be discontinued. Consideration of personal preference is critical to improve quality of life and reduce diabetes related distress.

All glucose lowering agents can be used safely for treatment of type 2 diabetes in older persons, with some considerations described below. Most agents are equally efficacious when used as monotherapy and lower HbA_{1c} by approximately 1% / 11 mmol/mol. Alpha-glucosidase and DPP-4 inhibitors have a little lower efficacy, lowering HbA_{1c} by 0.5-0.7% / 6-8 mmol/mol respectively.

The blood glucose control treatment algorithm for older people with diabetes is summarized in Figure 1. Metformin is often the preferred agent first-line therapy if lifestyle modifications alone are not adequate to achieve glycaemic goals, in both younger and older adults with diabetes[103]. Its low potential for hypoglycaemia and low cost combined with high efficacy are favourable features. The risks and benefits of metformin use to prevent cardiovascular outcomes have been controversial. A recent meta-analysis of 13 randomized controlled trials evaluating the effects of metformin on cardiovascular morbidity and mortality in individuals with type 2 diabetes showed no clear benefits[108]. However, an epidemiological analysis of older participants (60-80 years; n=10,559) of the Reduction of Atherothrombosis of Continued Health (REACH) registry, showed overall lower 2 year mortality in people with atherothrombosis treated with metformin vs. without metformin[109]. A multicentre longitudinal cohort study evaluating body mass in older men showed that older men with diabetes using insulin sensitizers (metformin or thiazolidinediones) lost significantly less total lean mass compared with those with untreated diabetes or treated with other hypoglycaemic agents[110]. Metformin may cause unintended weight loss and higher gastrointestinal side-effects in older persons. The main clinical issue with metformin is its use in the presence of renal impairment. Renal function (measurement of serum creatinine and calculation of eGFR) should be assessed before prescribing metformin and should be checked regularly in older people using metformin. This may be problematic in many countries or locations without ready access to measurement of creatinine. In this case it may be preferable to choose an alternate agent. The use of metformin is considered safe in lower doses in people with an eGFR between 30-45 ml/min/1.73 m^2 but should not be used in people with eGFR < 30 ml/min/1.73 m^2. It is also contraindicated in conditions causing intravascular dehydration (congestive heart failure, contrast dye administrations, renal and hepatic dysfunction) thus limiting its use in some older adults. However, a recent review suggested that metformin-associated risk of lactic acidosis is exceedingly rare when it is used carefully following estimation of eGFR[111].

Sulfonylureas are effective, relatively inexpensive, and widely available in most countries in the world and can be used as first-line therapy if metformin is not tolerated or contraindicated. Outcome studies, the UKPDS[112] and ADVANCE study[84], both showed that intensive therapy with sulfonylurea-based treatment improved long-term outcomes. The class is associated with an increased risk of hypoglycaemia which varies between agents. Glyburide/glibenclamide has the highest risk of hypoglycaemia and gliclazide the lowest[113,114]. A recent review assessed the comparative safety and efficacy of four commonly available sulfonylureas (glibenclamide/glyburide, gliclazide, glimepiride, and glipizide) for the treatment of older people with type 2 diabetes for the WHO Essential Medicines List (EML) for adults[115]. Based on safety, efficacy, cost, and availability of sulfonylureas, the review recommended that glibenclamide/glyburide should not be used in people older than 60 years of age and that gliclazide should be added to the EML for use in the older people with type 2 diabetes (with other sulfonylureas, but not glibenclamide/glyburide, as acceptable alternatives). The ADVANCE study achieved improved outcomes with gliclazide without weight gain and with low rates of hypoglycaemia. Sulfonylureas are a good choice for older adults who eat consistently and are able to recognize and treat hypoglycaemia appropriately.

The glinides (repaglinide and nateglinide) are rapid-acting insulin secretagogues with a shorter half-life (60-90 minutes) compared with sulfonylureas. These medicines need to be taken just before meals and can be skipped if meals are skipped, thus avoiding hypoglycaemia in frail older people or those with dementia with irregular eating habits[116]. Disadvantages of this class include limited global availability, cost, and frequency of administration.

DPP-4 inhibitors are well tolerated in older adults[117,118]. They mainly have once a day dosing, can be used safely in individuals with renal insufficiency, and have low risk of hypoglycaemia without the risk of gastrointestinal side-effects[119]. These agents have lower efficacy (approximate HbA_{1c} lowering by 0.5-0.8% / 6-9 mmol/mol) than other agents and may not be easily available in many countries due to high expense. Two recent studies have demonstrated their cardiovascular safety but failed to show superiority against usual therapy[120,121].

Alpha-glucosidase inhibitors are still widely used in many countries and can be an alternative first-line agent. Low risk of hypoglycaemia, lower cost, and efficacy in lowering postprandial hyperglycaemia are important features when used in older people[122]. However, the major limiting factor for use is the gastrointestinal side-effects, such as flatulence and diarrhoea. A large meta-analysis of randomized placebo controlled studies has shown improved risk profile for myocardial infarction and any cardiovascular event in people taking

alpha-glucosidase based therapy[123].

Thiazolidinediones are an effective glucose lowering agent and have a low risk of hypoglycaemia. However the class has a significant side-effect profile (e.g. weight gain, fluid retention, peripheral oedema, aggravation of congestive heart failure) and safely concerns due to increased risk of fractures[124,125]. The concern about an increased the risk of myocardial infarction with rosiglitazone and the increased risk of bladder cancer with pioglitazone has significantly decreased enthusiasm about the use of these agents. However in selected older people, these agents may still have a role due to their efficacy, low risk of hypoglycaemia, and once a day dosing. Regulatory restrictions may apply for these agents in different parts of the world.

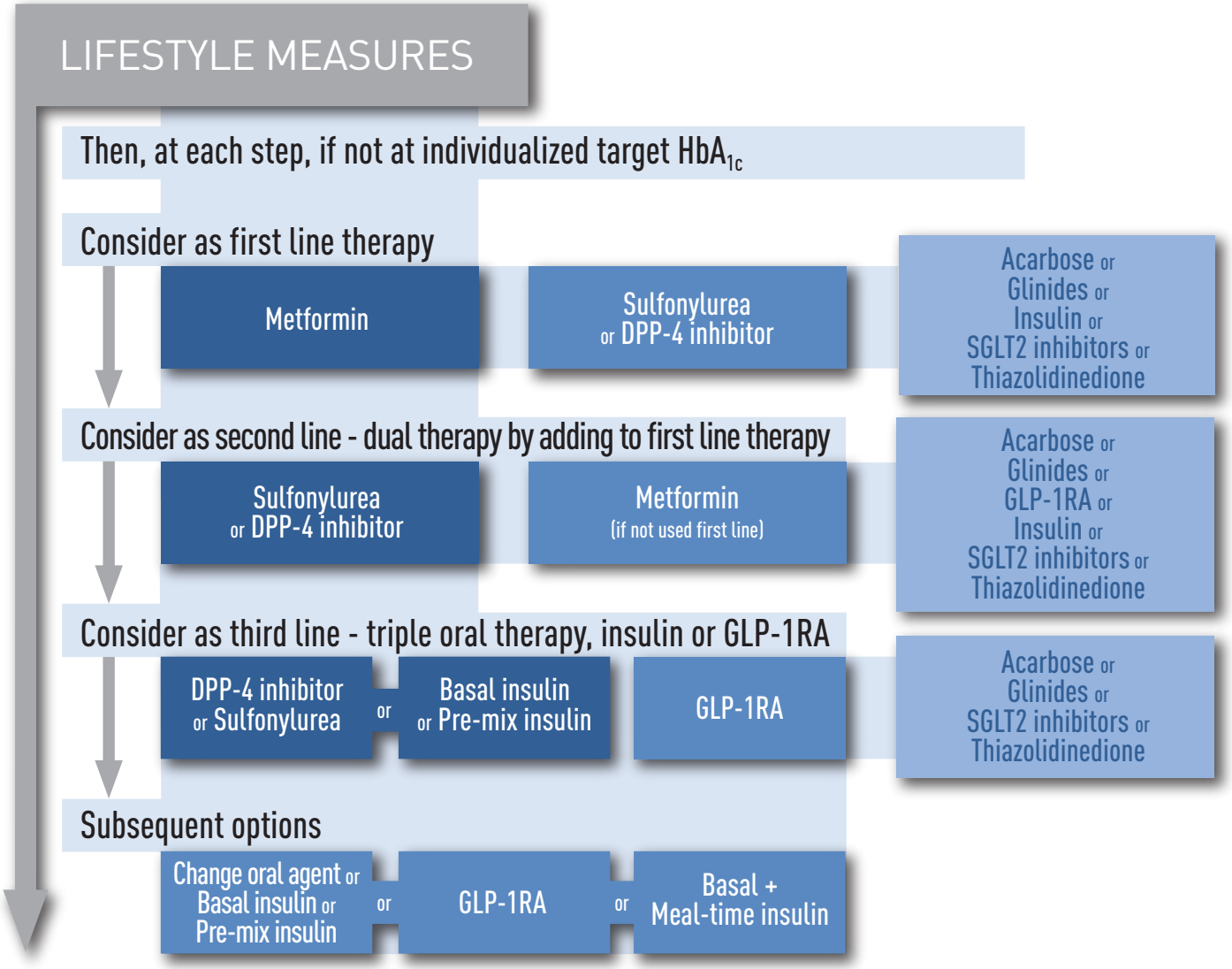
GLP-1 RA are incretin mimetic agents with limited data for use in older populations[99]. Small studies have shown equal efficacy and tolerability in younger and older people[126]. Although they require subcutaneous injection and could be difficult to use in some older people, they have low potential for hypoglycaemia and are effective in lowering both fasting and postprandial hyperglycaemia. Formulations available for use as once a day or once a week are also attractive for older people. Cost and limited availability of this class in many parts of the world are major determinants of their use. They are effective in lowering glycaemia (approximate reduction of HbA_{1c} by 1% / 11 mmol/mol) but gastrointestinal side-effects such as nausea and vomiting are common, especially in early stages of their use, but can be minimized by increasing the dose gradually [127]. This class may not be appropriate for frail older people in whom weight loss can be detrimental. Long-term safety data are not available for these agents.

Sodium-glucose co-transporter 2 (SGLT2) inhibitors are a new class of glucose lowering agents. Given their recent availability, experience with clinical use is limited and there are no long-term data. Extensive clinical trials have demonstrated their efficacy in conjunction with low risk of hypoglycaemia and weight loss. They can be used as monotherapy or with metformin, sulfonylureas, thiazolidinediones, and insulin. Their renal mode of action results in reduced efficacy in the presence of renal insufficiency. They are associated with an increased risk of genital and urinary tract infections. Hypovolaemia, postural hypotension, and weight loss may limit their use in some older people.

There are multiple choices of agents that can be used as second- and third-line therapies. While individualization of therapy is desirable based on risk of hypoglycaemia, comorbidities, functionality, and personal preference [6], in reality cost, availability, and local prescribing regulations are the major determinants of therapeutic choice in many parts of the world. Taking all these considerations into account, the treatment algorithm (Figure 1) identifies what can be considered from a global aspect to be the usual therapeutic approach and then provides a range of alternatives and other options. The algorithm is not designed to be prescriptive but rather provides a framework for countries and health services to adapt to local circumstances.

Insulin is now available in various formulations (preparations and delivery system) which can be used to target hyperglycaemia at different times of the day. A recent analysis of pooled data from randomized studies has shown that the relative contribution of basal hyperglycaemia is lower and that of postprandial hyperglycaemia is greater in older compared with younger people at all HbA_{1c} levels[128]. Therefore in older people with diabetes, the type of insulin (basal, premixed, prandial) now provides flexibility to tailor treatment regimens to individual needs. Newer insulin analogues and older insulin preparations have been compared in a Cochrane review for efficacy and side-effects, especially hypoglycaemia, with neither short acting nor long acting insulin preparations showing conclusive superiority[129,130]. Recent evidence indicates that long acting insulin use can be safe and efficacious in older people with diabetes compared with other types of insulin[131,132] and are particularly attractive for older adults as they can be used safely and easily with oral glucose lowering agents. Prandial insulin, especially when used in a complex regimen strategy, may increase risk of errors in older people.

Figure 1. Blood glucose treatment algorithm for older people with diabetes



Usual approach

Alternative approaches

Other options (alphabetical order)

Considerations:
- Functional capacity
- Frailty
- Dementia
- End of life

Medication Choice:
- Renal function
- SU with low hypoglycaemia risk
- Medication side effect profile
- Potential harms of medications which induce weight loss
- Cost
- Availability
- Local prescribing rules
- Discontinue ineffective treatment

DPP-4 dipeptidyl peptidase 4
GLP-1 RA glucagon-like peptide-1 receptor antagonist
HbA_{1c} glycated haemoglobin
SGLT2 sodium glucose co-transporter 2
SU sulfonylurea

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

More awareness of the special issues operating in older people with diabetes and the use of clinically useful tools to evaluate age-specific barriers is needed and should be offered both in hospital settings and in the community. Staff from rehabilitation facilities and nursing homes should be educated in the areas of different actions of different glucose lowering treatments, their potential side-effects, and related precautions.

The major limitation in developing an algorithm for diabetes management in older persons is the lack of studies comparing different agents, their effectiveness, and their safety in this age group. Most of the treatment options or combinations of treatment options are extrapolated from data in younger and middle-aged populations. Additionally, people with cognitive and functional impairment and depression are not included in clinical trials and these variables are hard to assess in observational studies, and usually not considered in outcome analyses.

EVALUATION AND CLINICAL AUDIT INDICATORS

Evaluation parameters should be similar to those recommended for all adults with special focus on surveillance rates of emergency room and hospital visits for hypoglycaemia, medicine errors/ overdose, use of agents with high risk of hypoglycaemia, rate of falls, and quality of life.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes with a HbA_{1c} in the appropriate functional category seen in the previous year	Total number of older people with type 2 diabetes seen in the previous year	Number of older people with type 2 diabetes with a HbA_{1c} in the appropriate functional category as a percentage of total number of older people with type 2 diabetes seen in the previous year	Documentation and date of assessment

12

BLOOD PRESSURE MANAGEMENT

RECOMMENDATIONS

GENERAL

- The diagnosis of hypertension should be based on at least three different blood pressure measurements, taken on more than two separate visits.
- A diagnosis of hypertension is established by demonstrating a SBP ≥ 140 mmHg and/or a diastolic blood pressure (DBP) ≥ 90 mmHg on at least two occasions[133].
- Blood pressure should be measured at every routine clinical visit, including standing blood pressure in those taking blood pressure lowering medicines to exclude orthostatic hypotension, especially in people with neuropathy.
- Non-pharmacological interventions should be tried initially focussing on reducing salt intake, stopping smoking, restricting alcohol consumption (if relevant), and encouraging regular physical activity.
- Pharmacological therapy should be initiated in addition to lifestyle interventions after 6 weeks of non-pharmacological therapy fails to achieve blood pressure targets[134].
- Renal function and electrolytes should be monitored at the commencement of pharmacotherapy.
- ACE-inhibitors are the treatment of first choice for initiating therapy, especially in the presence of diabetic nephropathy.
- ARBs can be used as initial therapy in people who cannot tolerate ACE-inhibitors.
- Diuretics or calcium channel blockers (CCBs) can be used as the first add-on therapy to ACE-inhibitors and ARBs if they fail to achieve target blood pressure.
- Beta-blockers should be considered for combination therapy in people with tachycardia or coronary artery disease.
- Alpha-blockers may be helpful in older people as add-on therapy, especially in men with prostate enlargement.
- Certain combinations of therapies should be avoided including ACE-inhibitors and ARBs, potassium-sparing diuretic plus either an ACE-inhibitor and ARB, and beta-blocker plus verapamil.
- Any blood pressure lowering therapy should be started at the lowest dose and gradually increased, depending on the blood pressure response, to the maximum tolerated dose.
- If the response is inadequate, a second medication from another class should be added, provided the initial medication is tolerated. A single-medication combination may improve medication compliance.
- If there are adverse effects or if no therapeutic response has been achieved, a medication from another class should be substituted or a third agent from another class added.
- Explore possible reasons for the inadequate response before adding medications or increasing the dose.
- Down-titration of medications may be necessary, especially in the presence of polypharmacy and declining renal function.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- These individuals should be managed to achieve a target blood pressure of less than 140/90 mmHg.
- All treatment options generally apply to this category.

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CATEGORY 2: FUNCTIONALLY DEPENDENT

- The principles are as for *Category 1: Functionally Independent.*
- Non-pharmacological interventions may not be possible.
- Diuretics can precipitate falls in vulnerable individuals and inconvenient micturition and should be prescribed with caution in the very frail or those with advanced dementia who have impaired mobility or balance.
- Caregivers should be provided with sufficient knowledge and support to arrange the safe administration of blood pressure lowering therapy.

Sub-category A: Frail

- A target blood pressure of up to 150/90 mmHg may be appropriate.

Sub-category B: Dementia

- A target blood pressure of 140/90 mmHg should be attempted in these individuals with cognitive impairment.
- Among individuals with advanced dementia, strict control of blood pressure may not have any added advantage.
- Pharmacotherapy should be approached with caution in people with advanced dementia with poor caregiver support.

CATEGORY 3: END OF LIFE CARE

- Unless the blood pressure readings are immediately life threatening, strict control of blood pressure may not be necessary, and withdrawal of blood pressure lowering therapy may be appropriate.
- Non-pharmacological interventions are not usually possible or indicated.
- If blood pressure lowering therapy is considered necessary, ACE-inhibitors and ARBs remain the medicines of choice.

RATIONALE AND EVIDENCE BASE

Hypertension is a common comorbidity in people with diabetes being 1.5 to three times more common than in those without diabetes[135]. Most (60-80%) people with type 2 diabetes die of cardiovascular complications, and up to 75% of specific cardiovascular complications have been attributed to hypertension[136]. Hypertensive people with diabetes are also at increased risk for diabetes-specific complications including nephropathy and retinopathy.

Treating hypertension reduces the risk of stroke and other adverse cardiovascular events. A 2011 meta-analysis of randomized controlled trials in hypertensive people aged 75 and over concluded that treatment reduced cardiovascular morbidity and mortality and the incidence of heart failure, even though total mortality was not affected[137].

Specific randomized clinical trials which have compared the effects on clinical outcomes of achieving different blood pressure values in older adults with diabetes are lacking. In the absence of randomized clinical trials data, the generally recommended target blood pressure target for older people with diabetes is less than 140/90 mmHg[133,138,139]. Results of the ACCORD blood pressure trial among people older than 65 years of age found no additional benefit of a target systolic pressure less than 120 mmHg compared with a target of 140 mmHg[140]. Pharmacological treatment of very old people with hypertension decreases the risk of cardiovascular morbidity and mortality[141-143]. However, there may be potential harm associated with low on-treatment blood pressure as suggested by the ACCORD. Also observational data from an extended follow-up of the predominantly elderly International VErapamil SR/Trandolapril (INVEST) Study diabetes cohort suggest an increase in mortality when on-treatment SBP is less than 115 mmHg or DBP is less than 65 mmHg[144].

Lifestyle interventions are the recommended first step in managing high blood pressure in older people, although specific data on older people with diabetes are lacking. Controlled trials in essential hypertension have shown a reduction in SBP of approximately 5 mmHg and DBP of 2-3 mmHg with moderate sodium restriction. The DASH diet included a maximum of 2.4 g of sodium per day [134,145].

Direct evidence for pharmacological treatment of hypertension in

older adults with diabetes is also limited and what is available has been extrapolated from other studies. These have been mostly from trials on hypertensive older individuals and some with subset analysis of the diabetic population involved in these trials.

ACE-inhibitors have been shown to prevent or delay microvascular and macrovascular complications of diabetes[138]. ACE-inhibitors delay progression of diabetic kidney disease and are more effective than other medications in delaying the onset of kidney failure (i.e. glomerular filtration rate^{GFR} of less than 15 ml/min/1.73 m^2 or need for dialysis) in people who have hypertension and type 2 diabetes with macroalbuminuria[138,146]. ACE-inhibitors should be considered the medication of choice in older people with diabetes and hypertension as they proven survival benefits even in the presence of coronary disease, microalbuminuria, and diabetic nephropathy[133]. The main adverse effects of ACE-inhibitors include hypotension, chronic dry cough, and rarely, angioedema or rash. ARBs are a proven alternative and also reduce mortality and morbidity in hypertensive older people with diabetes. ARBs can be considered first-line treatment and as an alternative to ACE-inhibitors in people with hypertension who cannot tolerate ACE-inhibitors. The renoprotective effects of ACE-inhibitors and ARBs may be independent of their blood pressure lowering properties.

Beta-blockers can be considered, especially in people with an elevated pulse rate[147]. The main concern is the masking of hypoglycaemic symptoms. However the UKPDS 39 trial showed similar rates of major hypoglycaemic events in groups treated with beta-blockers and ACE-inhibitors[148]. Beta-blockers should be considered as part of combination therapy for people with tachycardia and/or coronary artery disease.

Dihydropyridine CCBs reduce cardiovascular events in people with diabetes and hypertension. However, they have been shown to be inferior to other agents in reducing some cardiovascular outcomes and in slowing progression of diabetic kidney disease[146,149]. Two large trials have also shown a significantly greater risk of fatal and nonfatal myocardial infarction in people with type 2 diabetes treated with a dihydropyridine CCB compared with those treated with an ACE-inhibitor[150,151]. Because CCBs may be inferior in some outcomes, they are usually reserved for combination therapy or as initial therapy in those who cannot tolerate other preferred agents[151].

Therapy using two (or three) agents may also be required to control blood pressure and are sometimes considered as initial treatment of severe hypertension. Combination therapy should include medications from different classes. The usual approach is to add a diuretic or a CCB to an ACE-inhibitor or ARB if monotherapy fails to control blood pressure. It should be noted that some combinations should be avoided (*see Recommendations*).

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Measurement of blood pressure should take place during every routine visit of an older person with diabetes. A baseline and regular evaluation of end organ damage and other comorbidities should be performed. It is important to consider and rule out secondary causes of hypertension which could be potentially reversible. Healthcare professionals and caregivers should have an understanding of medicines effects and side-effects.

EVALUATION AND CLINICAL AUDIT INDICATORS

The proportion of people in whom blood pressure targets are achieved should be ascertained and the proportion with blood pressure above target range who are on pharmacological or non-pharmacological treatment determined. Training, proficiency of staff and availability of appropriate equipment for measurement of blood pressure should be ascertained.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes and hypertension seen in the previous year with blood pressure levels within target range for functional category	Number of older people with type 2 diabetes and hypertension seen in the previous year	Number of older people with type 2 diabetes and hypertension with blood pressure levels in the target range as a percentage of all older people with type 2 diabetes and hypertension seen in the previous year	Documentation and time of assessment

13

MANAGEMENT OF DYSLIPIDAEMIA

RECOMMENDATIONS

GENERAL

- Assessment of lipids is an integral part of cardiovascular risk assessment.
- A full lipid profile, including total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglycerides should be assessed initially and then at clinically relevant intervals.
- Non-pharmacological interventions should include a dietary review taking into account the overall principles of nutrition in older people (*see Chapter 8: Nutrition, physical activity, and exercise).*
- All older people with diabetes are at high CVD risk and should be considered for treatment with a statin unless contraindicated or considered clinically inappropriate.
- Lower statin doses should be used and indications of side-effects (especially muscular and hepatic) or possible drug interaction monitored.
- General lipid targets are as follows: LDL cholesterol < 2.0 mmol/l (< 80 mg/dl), triglyceride < 2.3 mmol/l (< 200 mg/dl), HDL cholesterol > 1.0 mmol/l (> 39 mg/dl), non-HDL cholesterol < 2.5 mmol/l (< 97 mg/dl). LDL cholesterol should be < 1.8 mmol/l (< 70 mg/dl) in established CVD.
- Other lipid lowering therapies (fenofibrate, bile acid binding resins, ezetimibe, sustained release nicotinic acid, concentrated omega-3 fatty acids) may be appropriate in some individuals failing to reach lipid targets or intolerant of conventional medications. Niacin should be avoided in older people with diabetes.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- These individuals should be actively managed to reduce CVD risk.
- All treatment options generally apply to this category with statins as first-line therapy.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- The principles are as for *Category 1: Functionally Independent.*
- Non-pharmacological interventions may not be possible.
- Caregivers should be provided with sufficient knowledge and support to arrange the safe administration of lipid lowering therapy and monitor side-effects.

Sub-category A: Frail

- Statins should be used as clinically indicated, especially in individuals with established CVD.
- Carefully monitor for indications of statin muscular side-effects.
- Statins should not be combined with fibrates.
- Lipid targets and frequency of lipid measurement can be relaxed.

Sub-category B: Dementia

- Lipid targets and frequency of lipid measurement can be relaxed.
- The appropriateness of statin use in individuals with non-atherosclerotic dementia should be considered.
- Pharmacotherapy should be approached with caution in people with advanced dementia with poor caregiver support.

CATEGORY 3: END OF LIFE CARE

- Lipid lowering therapy is not usually necessary, and withdrawal of therapy may be appropriate.

RATIONALE AND EVIDENCE BASE

Older people with diabetes are a high risk group for CVD, although epidemiological studies suggest that the relative risk for coronary heart disease associated with high cholesterol decreases with age[152]. Significant benefits have been demonstrated from lipid lowering to reduce cardiovascular morbidity and mortality[153]. Lowering serum cholesterol by 1 mmol/l reduces risk of coronary heart disease mortality by 50% in people aged 40-49 years while the risk reduction is 33% in those aged 50-69 years and 15% in those aged 70-89 years[154]. Although relative risk reduction decreases with age, the absolute effects of lower cholesterol on coronary heart disease reduction in older subjects are greater due to the higher prevalence of atheroma and CVD. In addition, in old age, there is an inverse relationship between high cholesterol and the risk of stroke[155] and there are conflicting data on the relationship between high cholesterol and non-cardiovascular mortality. However evidence for benefits of treatment in people aged over 80 years is limited and clinicians need to make decisions based on individualized management.

Metabolic dyslipidaemia in type 2 diabetes is characterized by moderately increased triglyceride levels carried in very-low-density lipoprotein (VLDL) particles, reduced HDL cholesterol levels carried in small HDL particles, and LDL cholesterol levels that contribute to increased morbidity and mortality[160,161]. Low levels of HDL cholesterol are associated with increased risk of CVDs and ischemic stroke in older people with diabetes[158].

Hyperlipidaemia is not only an important risk factor for coronary artery disease but also for aortic valve disease, stroke, and peripheral vascular disease including abdominal aortic aneurysm and also multi-infarct type of dementia in older people. Secondary causes of elevated lipids should be excluded especially excessive alcohol consumption and hypothyroidism.

Statin therapy in older people has recently been reviewed[159]. Statins are most beneficial for preventing cardiovascular events in people who already have coronary heart disease and reduce vascular events and mortality[160]. Statins are associated with a decrease in recurrent ischaemic stroke but an increase in haemorrhagic stroke in secondary prevention in people with cerebrovascular disease[161]. Their efficacy in primary prevention of CVD in older people is unclear with one study suggesting an increase in effect over 5 years, with only minimal benefits over placebo in the first year[161].

In older adults, exposure to higher doses of statins or higher potency statins does not increase their effectiveness, but does increase the risk of adverse effects such as myopathy and cognitive impairment. With ageing, there is a decrease in body size, particularly in muscle mass, and in hepatic and renal function, so the same dose will result in a greater degree of exposure in older people.

The most common adverse effect that limits treatment with statins is muscle symptoms - myalgia, myositis, and rarely rhabdomyolysis. The risks of muscle symptoms are related to the dose of the statin and the risk of muscle damage increases with age over 70 years, and with age-associated factors such as multiple medication use, comorbidity, and sarcopenia. Statin myopathy is likely to have a greater impact in older people.

The effect of statins on cognition are conflicting[162]. In people with dementia, statins do not significantly affect cognitive decline, global function, behaviour or activities of daily living[162]. However one study has reported that statin withdrawal was associated with improvements in cognitive function in people with Alzheimer's disease and rechallenge with statins was associated with a decline in cognition function[163].

Statins should be discontinued when the potential benefits are no longer clinically relevant. In people with severe physical or cognitive impairments, or those in their last year of life, therapeutic aims often change from preventative to palliative and reducing the risk of vascular events or mortality may not be relevant.

Fibrates, including gemfibrozil and fenofibrate, can be used as monotherapy or for adjunctive therapy for treatment of dyslipidaemias, particularly in people who have hypertriglyceridaemia and/or low

HDL cholesterol[164]. The major benefit of fibrates is their effect on triglycerides and HDL cholesterol. Concurrent use of gemfibrozil and statins in older people or those with chronic kidney disease (CKD) should be avoided[165].

Data on the use of other agents in older people are limited and the usual considerations apply. Nicotinic acid may worsen hyperglycaemia is not recommended in older people with diabetes[166,167]. Bile acid sequestrants are associated with poor compliance and more side-effects in older individuals[168] and should be used with caution.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Measurement of lipids should be considered as part of the assessment of CVD risk. Secondary causes of elevated lipids, particularly metabolic dyslipidaemia should be considered. Since CVD risk is high in all older people, even those without established CVD, statin therapy should be considered in all. Monitoring of lipid levels may not be necessary on a routine basis but careful monitoring for potential statin side-effects, especially on muscle, is essential.

EVALUATION AND CLINICAL AUDIT INDICATORS

Managing lipids in older subjects should be part of a multifaceted approach to diabetes care. A search for atherosclerotic disease such as coronary artery disease, peripheral artery disease, symptomatic carotid artery disease or abdominal aortic aneurysms, and a family history of premature coronary artery disease should be part of a comprehensive screen at diagnosis and at regular intervals thereafter.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes with a serum lipid measurement during the previous year	Total number of older people with type 2 diabetes seen in the previous year	Number of older people with type 2 diabetes with a serum lipid measurement during the previous year as a percentage of the total number of older people with type 2 diabetes seen in the previous year	Documentation and date of serum lipid measurement

14

INPATIENT DIABETES CARE INCLUDING SURGERY

RECOMMENDATIONS

GENERAL

- All people with diabetes admitted to hospital should have their diabetes clearly identified in the medical case records.
- All people with diabetes admitted to hospital should have their blood glucose level and HbA_{1c} measured with results available to all members of the healthcare team.
- Emergency rooms must have clearly visible standing orders stating all critically ill older people must have their blood glucose checked.
- Hospitals should designate an individual in charge of matters relating to the inpatient care of all people with diabetes to:
  - Manage and coordinate systems of care related to diabetes management of inpatients.
  - Co-ordinate training of hospital staff on the needs of people with diabetes.
  - Implement strategies to enable those who could self-manage their diabetes.
  - Plan for discharge with self-management training and periodic follow-up.
- All inpatients with diabetes (and their medical/nursing teams) should have ready access to a multidisciplinary specialist diabetes team.
- Encouragement of self-management of diabetes should be integrated into usual ward care.
- Usual blood glucose targets are < 8.0 mmol/l (140 mg/dl) in the fasting state and < 10 mmol/l (180 mg/dl) after meals AND hypoglycaemic should be strictly avoided.
- Evaluate blood glucose control and metabolic and vascular complications (in particular renal and cardiac status) prior to planned procedures; provide advice on the management of diabetes on the day or days prior to the procedure.
- Ensure provision and use of an agreed protocol for inpatient procedures and surgical operations.
- Intravenous insulin is advisable in certain situations, e.g. long operations or metabolic decompensation.
- When intravenous insulin is needed, it is commonly given as a glucose/insulin/potassium infusion.
- Subcutaneous insulin protocols should use basal and supplemental bolus regimens and not "sliding scale insulin".
- Strategies to avoid unnecessary hospital admission of older people with diabetes should be an important consideration in community and primary care settings and be focused around minimizing severe hypoglycaemia, early detection and treatment of respiratory and urinary infections, and active case-planning around individualized care, goal setting, and undertaking regular comprehensive medicine reviews and stopping medicines where possible.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Provide access to intensive care units (ICU) for life-threatening illness, usually with intravenous insulin therapy.
- Provide protocol-driven care to ensure detection and immediate control of hyperglycaemia in acute coronary event or stroke, normally using intravenous insulin therapy.

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CATEGORY 2: FUNCTIONALLY DEPENDENT

- All the above considerations apply but caregivers should be included in decision making and discharge planning.
- Inpatient diabetes care should focus on minimizing risk of hypoglycaemia.
- When insulin is used, consider safety issues first.

Sub-category A: Frail

- Minimize treatment changes that could disrupt the person's post discharge diabetes treatment.

Sub-category B: dementia

- Increase involvement of caregivers during inpatient stay.
- Remain vigilant about recognizing and managing psychiatric disorders which may arise.
- Remain vigilant about delirium or swallowing disorders that can lead to pneumonia of hypoglycaemia.

CATEGORY 3: END OF LIFE CARE

- Attempt to maintain the highest quality of life available bearing in mind the adverse symptoms of excessive hyperglycaemia.
- Therapy should aim to avoid symptoms relating to hypoglycaemia and excessive hyperglycaemia.
- Monitor glucose (twice daily to once every 3 days depending on the patient's condition) and maintain blood glucose between 9-15 mmol/l (160-270 mg/dl).
- A care plan should be developed with clear instructions for the inpatient healthcare team, patient, and family.
- Diabetes and palliative care teams should work collaboratively to provide support, education, and advice to patients, relatives, and healthcare staff.
- Inpatient teams should be aware of situations which may result in hypo- or hyperglycaemia:
  - Anorexia-cachexia syndrome and anorexia from chemotherapy and opiate analgesics.
  - Malnourishment.
  - Swallowing disorders.
  - Corticosteroid therapy.
- Consider changing or withdrawing insulin and oral glucose lowering therapies which may be causing side-effects or increasing risk of hypoglycaemia.

RATIONALE AND EVIDENCE BASE

In the older population, both hyperglycaemia and hypoglycaemia are of greater risk in hospital settings. An older inpatient with hyperglycaemia, with or without a prior diagnosis of diabetes, is at increased risk of premature mortality and disease-specific morbidity. Hypoglycaemia among hospitalized older people with diabetes is also a frequent problem. Hypoglycaemia is responsible for up to 25% of fatal events that occur in people with diabetes admitted into United States hospitals annually.

Although iatrogenic hypoglycaemia is associated with adverse outcomes, it may be a marker for illness rather than causal in itself. Several factors, such as administration of exogenous insulin, mismatch of insulin administration with nutrition, and the loss of normal counter-regulatory responses, place older people with diabetes at a higher risk for hypoglycaemia than people without diabetes. Thus, proper management of both hypo- and hyperglycaemia during inpatient care is essential. Furthermore, many older adults with diabetes rely on family members, friends, or healthcare-givers to help them manage medical conditions, as well as to implement day-to-day treatments. In the case of individuals with cognitive deficits,

family members, or caregivers serve as surrogate decision makers. Thus, medical information needs to be shared with all concerned.

Diabetes affects approximately 25% of the population ≥ 65 years, and that percentage is increasing rapidly, particularly in minorities who represent an important fraction of the uninsured/under-insured[169]. Diabetes is an important cause of hospital admissions and comorbidity and impacts on mortality and quality of life[170]. There is clear evidence that older people with diabetes have a difficult time managing diabetes when frailty and/or dementia is present, especially during the hospital stay.

Many clinical guidelines and publications have addressed and recommended inpatient management of hyper- and hypoglycaemia in older adults [4,100]. Similar to the general populations, there are three situations in which hyperglycaemia can occur in hospitals – people with known diabetes, previously undiagnosed diabetes, or transient hospital related hyperglycaemia. These complications can lead to increased healthcare costs, as well as adverse clinical outcomes. The American Diabetes Association[138] recommends that critically ill people in ICU would normally be treated with an insulin infusion aiming to maintain glucose levels between 7.8-10 mmol/l (140-180 mg/dl). Glucose targets < 6.1 mmol/l (110 mg/dl) are not recommended. Insulin infusion should also be considered during other illness requiring prompt glycaemic control, or prolonged fasting. There is a lack of studies on non-critically ill people but the general glucose target range is also 7.8-10 mmol/l (140-180 mg/dl), as long as these can be achieved safely. Insulin may be the preferred therapy in the hospital setting in the majority of clinical situations. This would usually comprise scheduled subcutaneous basal insulin with supplemental short acting insulin if required. Insulin is the most effective and flexible regimen to achieve inpatient glycaemic control, whether by infusion or by subcutaneous basal bolus regimens. Prolonged therapy with sliding scale insulin is not routinely recommended. Continuation of oral glucose lowering agents may be appropriate in selected stable people who are expected to consume meals at regular intervals. Specific caution is required with metformin due to the possibility that a contraindication may develop during the hospitalization, such as renal insufficiency, unstable haemodynamic status, or need for an imaging study that requires a radio-contrast dye. Basal-bolus treatment improved glycaemic control and reduced hospital complications compared with sliding scale regular insulin in general surgery in people with type 2 diabetes[171].

The management of diabetes with terminal illness will become a more common practice as the ageing population increases. However, currently, there is a no agreement and consensus among physicians and multidisciplinary teams. Therefore, managing hypoglycaemia and hyperglycaemia is essential to maintain mental status and good interaction with family members, as well as maintaining quality of life[172,173].

Discharge planning should take into consideration the persons glycaemic control, treatment regimen, financial and physical limitations, social support, comorbid medical conditions, risk of hypoglycaemia, and an overall prognosis to create an individualized safe and effective medication regimen for optimal glycaemic control at home[174].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Implementation requires systems of care and protocols and staff trained to ensure their effectiveness. Standardized protocols, developed by multidisciplinary teams, should specify nutritional inpatient care, insulin dose regimens, how to identify inpatients at risk for hypoglycaemia, actions to be taken to prevent and treat hypoglycaemia, and discharge/follow-up plans. Bedside glucose monitoring requires defined administrative responsibility, a procedure manual, training, policies regarding frequency and procedures for alert values, quality control, and regular maintenance of equipment. All clinical teams managing older inpatients with diabetes should have knowledge and familiarity with a limited set of assessment procedures that include the domains of cognition, mood, physical function, and nutrition.

EVALUATION AND CLINICAL AUDIT INDICATORS

It is important that hospitals designate a 'diabetes lead' individual to be in charge of matters relating to diabetes and coordinate training of staff in awareness of the needs of those with diabetes and develop strategies to prevent disempowerment of those who could self-manage their diabetes.

Diabetes should remain as a major consideration but not complicate the management of whatever condition resulted in admission to the hospital. It is imperative that a person should not be discharged with their overall diabetes state worse off than when they were admitted.

Evaluation should consider evidence of the availability of trained staff (and training courses) that have a focus on inpatient diabetes care, the use of protocols relating to blood glucose monitoring, use of insulin in acute illness, management of hypoglycaemia, and management of diabetes on corticosteroid therapy, the use of audits that assess compliance with inpatient protocols including pre-operative, peri-operative, and post-operative care and the use of audits that examine inpatient morbidity and mortality in people with diabetes.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes receiving a care plan when admitted to hospital	Number of older people with type 2 admitted to hospital over the previous	Number of older people with type 2 diabetes receiving a care plan when admitted to hospital as a percentage of the total number of older people with type 2 admitted to hospital over the previous	Documentation of: (a) presence of diabetes (b) of a care plan

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MANAGEMENT OF RENAL IMPAIRMENT

RECOMMENDATIONS

GENERAL

- Kidney function should be assessed at diagnosis and annually by measuring:
  - Serum creatinine and calculation of eGFR.
  - Urine test for albuminuria (albumin: creatinine ratio [ACR]).
- CKD which is diagnosed on the basis of a reduced eGFR (< 30 ml/min/1.73 m^2) calculated from the MDRD or CKD-EPI formula and using a standardized creatinine assay; or when the urine albumin/protein is elevated.
- Urinary ACR measurement in an early morning first void spot specimen is the preferred method for assessment of albuminuria/ proteinuria. Where a first void specimen is not possible or practical, a random spot urine specimen is acceptable. ACR can be measured in the laboratory or at site-of-care.
- If ACR is raised (microalbuminuria ACR > 2.5 mg/mmol in men, > 3.5 mg/mmol in women), repeat ACR twice over the following 4 months.
  - Microalbuminuria is confirmed if ACR is elevated in two out of three tests, in the absence of infection or overt proteinuria.
  - An ACR > 30 mg/mmol indicates macroalbuminuria.
- Individuals with CKD should be managed as follows:
  - Use ACE-inhibitors or ARBs in individuals with micro- or macroalbuminuria.
  - Management of elevated blood pressure (*see Chapter 12: Blood pressure management*).
  - Management of blood glucose (*see Chapter 11: Glucose control management and targets*).
  - Monitor ACR, eGFR, and serum potassium.
  - Advise limiting protein intake to 1 g/kg daily if proteinuric.
  - Intensify other renal and cardiovascular protection measures (*see Chapter 10: Cardiovascular risk*).
  - Consider medicines which should be used with caution or avoided (*see: Using quality use of medicines strategies to reduce the risk of medicine related adverse events in older people* at the end of *Chapter 5: Assessment and evaluation procedures for older people with diabetes*).
- Agree referral criteria for specialist renal care between local diabetes specialists and nephrologists. Referral criteria might include eGFR < 30 ml/min/1.73 m^2, progressive deterioration of kidney function, persistent proteinuria, biochemical, or fluid retention problems.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category as well as tighter blood pressure and glucose control targets (*see Chapter 12: Blood pressure management and Chapter 11: Glucose control management and targets*).

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CATEGORY 2: FUNCTIONALLY DEPENDENT

- The principles are as for Category 1: Functionally Independent (*see Chapter 12: Blood pressure management and Chapter 11: Glucose control management and targets*).
- Monitoring frequency for albuminuria could be relaxed after the initial assessment but regular measurement of creatinine (and calculation of eGFR) and potassium is essential.

Sub-category A: Frail

- All frail older people with diabetes and CKD should have a nutritional assessment at baseline and at appropriate intervals.
- In the presence of a reduced GFR of < 30 ml/min/1.73 m^2, the decision to refer to a nephrologist should be based on individualized considerations balancing likely benefits and risk of harm.

Sub-category B: dementia

- In the presence of reasonable physical health and absence of clinical frailty, people with dementia should be considered for care as per the general recommendations.
- Caregivers should receive appropriate education and training to provide care to older people with diabetes, CKD, and dementia and should have access to both diabetes and mental health services.

CATEGORY 3: END OF LIFE CARE

- There should be a high threshold for starting specific treatment for CKD.
- Consider withdrawal of medicines in line with a consideration of likely clinical benefits and risks of therapy.
- Minimize measurement of serum creatinine and potassium levels.

RATIONALE AND EVIDENCE BASE

The high prevalence of CKD in people with diabetes in ageing populations is associated with an increased risk of morbidity and mortality. Preventive and therapeutic interventions in older people with diabetes who are at risk of or have renal impairment can improve clinical outcomes, safety, avoid hospital admissions and institutionalization, and maintain quality of life. The prevention and early detection of developing kidney damage and monitoring these parameters is also useful to promote better cardiovascular protection.

Renal insufficiency often occurs without albuminuria, and may suggest aetiologies distinct from classical diabetic nephropathy, and is strongly associated with vascular comorbidities[175,176]. An early referral of older people with diabetes with CKD to a nephrologist, especially people with significant comorbidities, may improve outcomes[177,178].

The management of CKD focuses on assessment and blood pressure and blood glucose control (*see Chapter 11: Glucose control management and targets*). There is general consensus that screening in functionally independent older people should be performed at the time of diagnosis and annually thereafter[99,146]. Use ACE-inhibitors or ARBs have been specifically shown to be beneficial in the treatment of people with diabetes and CKD[78,139] and reduce progression of CKD[4,112,179-181]. The usual principles of blood glucose control apply but some glucose lowering agents require a dose reduction or should be avoided (*see Chapter 11: Glucose control management and targets*). The ADVANCE study reported a protective effect of gliclazide on renal function, which may be greater in people with microalbuminuria and with macroalbuminuria and declining GFR[182].

A number of medicines require dose reduction or should be avoided[183-185].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Clinicians should be trained in preventive, screening, and early diagnosis of renal disease in older people with diabetes. Also, effective clinical decision-making is required to choose the safest and most effective medicine and ensuring important nutritional issues are managed. Recommendations should be used with these cautions in mind and adapted according to local availability. It is important to consider the functional status of the individual and the safety and benefit of any management strategies when deciding treatment.

EVALUATION AND CLINICAL AUDIT INDICATORS

The percentage of people with annual urine albumin, serum creatinine, and eGFR measurements should be ascertained. Where abnormalities are detected, evidence of action to ensure tight but appropriate blood pressure control is required, together with achieved blood pressure. Ensure that blood pressure is measured regularly in people with type 2 diabetes and micro- or macroalbuminuria, and in renal insufficiency.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes having at least one creatinine measurement (and eGFR calculated) in the past year	Number of older people with type 2 diabetes seen in the past year	Number of older people with type 2 diabetes having at least one creatinine measurement (and eGFR calculated) in the past year as a percentage of the number of older people with type 2 diabetes seen in the past year	Documentation and date of the creatinine measurement (and calculated eGFR)

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SCREENING FOR DIABETES EYE DISEASE

RECOMMENDATIONS

GENERAL

- All older people with diabetes should have their eyes screened at the time of diagnosis and at least every 1-2 years thereafter. This should be part of a formal recall process.
- Depending on available resources, the eye examination could be done by direct fundoscopy through dilated pupils or fundus photography.
- Eye examination should include a check of visual acuity and measurement of intraocular pressure.
- People with diabetic eye disease should have optimal control of blood glucose, blood pressure, and blood lipids.
- Specialist referral and the urgency of appointment is as follows:
  - **Same day**: sudden loss of vision; evidence of retinal detachment.
  - **Within 1 week**: evidence of pre-retinal and/or vitreous haemorrhage; new vessel formation or rubeosis iridis.
  - **Within 1-2 months**: advanced retinal lesions (microaneurysms, venous beading, IRMAs in one quadrant; unexplained deterioration of visual acuity; macular oedema; unexplained retinal findings, cataract, inability to visualize fundus).
- All older adults and/or their caregivers should have the reasons for eye screening explained to them.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Every endeavour should be made to ensure frail, housebound, and aged care home residents receive clinically appropriate eye screening and care.

Sub-category A: Frail

- Management decision should consider the person's physical state *(see Chapter 11: Glucose control management and targets and Chapter 12: Blood pressure management).*

Sub-category B: Dementia

- A person with diabetes who lacks the mental capacity to consent to screening should not be permanently or automatically removed from a screening recall programme unless a 'best interest decision to do so has been taken on his or her behalf'.
- Convenient options for assessment should be considered and the least restrictive option chosen.
- Management decision should consider the person's mental capacity *(see Chapter 11: Glucose control management and targets and Chapter 12: Blood pressure management).*

CATEGORY 3: END OF LIFE CARE

- Routine eye screening will not usually be warranted.
- Ongoing treatment of known eye problems should be made on an individual basis after discussion between the person, attending physician, and caregivers.

RATIONALE AND EVIDENCE BASE

Diabetic retinopathy is the most common complication of diabetes and a major cause of visual loss. Older people with diabetes have the same level of risk of visual loss as younger people with diabetes, but the risk depends upon duration of diabetes[186,187] (which may not always be accurately known in type 2 diabetes), blood glucose control[112,188], blood pressure control[189,190], lipid Levels[191,192], age[193], genetic predisposition[194,195], and ethnicity[196,197]. Early detection by regular surveillance is essential if people with sight-threatening retinopathy are to be identified in time to offer laser treatment to prevent visual loss.

The importance of screening people with type 2 diabetes at diagnosis relates to the finding that between 21-39% already have some retinopathy present soon after diagnosis, with sight-threatening retinopathy in about 3%[187].

Optimizing blood glucose and blood pressure control is supported by reduced risk of microvascular complications in the UKPDS[112,181]. The ACCORD study found a reduced rate of progression of diabetic retinopathy with intensive glycaemic control and with intensive combination treatment of dyslipidaemia with statins and fenofibrate, but not with intensive blood pressure control[198]. The ADVANCE study reported additive effects of combined improved blood glucose and blood pressure control[199]. The Steno-2 study demonstrated that subjects receiving intensive multifactorial treatment had a significantly lower risk of retinopathy (hazard ratio, 0.42; 95% CI: 0.21-0.86)[200].

Quality screening procedures are crucial to ensure timely detection of retinopathy and intervention to prevent or minimize visual loss[201].

Provided an older person has good mental and physical health, they should be offered screening for diabetic retinopathy using the same method as in other functionally independent adults unless they choose not to be invited for retinal screening, a process referred to in the UK as "informed opt out". The UK National Health Service Diabetic Eye Screening programme guidance[202] has influenced the recommendations relating to *Category 2: Functionally Dependent* and *Category 3: End of Life Care. Screening* staff should be satisfied that the best interest decision has been reached in accordance with their local code of practice.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Clinicians should be aware of the importance of the prevention, screening, and early diagnosis of visual loss in older people with diabetes. This will involve ensuring that all services and pathways developed are adapted according to local availability and include those who may be less likely to be included in routine care. Training and education of healthcare teams should include a focus on older people with high levels of dependency who are less likely to receive routine eye screening services. Clinicians should consider the functional status of the individual and the safety and benefit of any eye screening services when deciding referral strategies.

EVALUATION AND CLINICAL AUDIT INDICATORS

Monitoring of an eye screening programme performance against a set of quality assurance standards is essential. Access to case records that contain evidence of eye examinations is important. These will need to demonstrate evidence of referral to various members of the diabetes eye team according to evidence of specific eye disease. Eye screening services should be routinely evaluated for quality and for their coverage of all eligible people including those in aged care homes or housebound older adults.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes diagnosed within the last year who were screened for diabetes eye disease at the time of diagnosis	Number of older people diagnosed with type 2 diabetes in the past year	Number of older people with type 2 diabetes diagnosed within the past year who were screened for diabetes eye disease as a percentage of all older people diagnosed with type 2 diabetes during the past year	Documentation and date of the eye screening procedure

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DIABETES FOOT DISEASE

RECOMMENDATIONS

GENERAL

- At each routine visit, the clinician should carry out a visual inspection of the feet looking for abnormal pressure sites, infection, or ulceration.
- At the initial visit and as part of the annual review, the examination should also include palpation of foot pulses (dorsalis pedis and posterior tibial vessels) and assessment for neuropathy using a 10 g monofilament; 128 Hz tuning fork or a biothesiometer (cut-off point for ulcer risk > 25 volts); or non-traumatic pin-prick.
- If there are signs or symptoms of ischaemia, a Doppler-measured ankle-brachial pressure measurement should be performed - a ratio of < 0.9 may indicate occlusive vascular disease.
- Classify the risk of an ulcer or amputation according to the foot assessment based on the clinical history and examination described above:
  - **No added risk**: no risk factors and no previous history of a foot ulcer or amputation.
  - **At risk**: one risk factor and no previous history of a foot ulcer or amputation.
  - **High risk**: two or more risk factors or a previous ulcer or amputation (very high risk).
- A foot care plan should be developed on the basis of the risk classification level:
  - **No added risk**: provide foot care education and review annually.
  - **At risk**: arrange a regular review, approximately 6 monthly, and at each review inspect both feet, evaluate footwear, and enhance foot care education.
  - **High risk**: arrange frequent reviews every 3-6 months, and at each review inspect both feet, evaluate footwear, consider the need for a vascular assessment or referral if indicated, and evaluate and ensure the appropriate provision of intensified foot care education.
- People with foot ulceration and infection require the following management:
  - Referral within 24 hours for relevant wound management - debridement, relief of pressure by mechanical off-loading, and control of infection.
  - Radiographs to rule out osteomyelitis, gas formation, the presence of foreign objects, and asymptomatic fractures.
  - A biopsy should be considered when ulcers appear at an atypical location.
  - Control of infection (when present). Infections should be classified as mild (superficial with minimal cellulitis), moderate (deeper than skin or more extensive cellulitis), or severe (accompanied by systemic signs of sepsis). The choice of antibiotic should be based on the severity of the infection and the likely aetiologic agent(s).
  - Reduction of weight bearing (walking with crutches, rest) and possible mechanical off-loading by total contact casts, cast walkers, shoe modifications, and orthotics.
  - Investigation and treatment for vascular insufficiency.
  - Optimal blood glucose control.
  - Individualized discussion of prevention of recurrence when ulcer has healed, including specialist footwear and orthotic care (e.g. insoles).

- Revascularization should be considered:
  - When a major amputation is being considered in a person with persistent ischaemic rest pain.
  - If a wound has a low probability of healing because of peripheral arterial disease (PAD).
  - There is the presence of a combined infection in the ischemic diabetic foot.
- Amputation should not be considered unless:
  - A detailed vascular evaluation has been performed by trained staff.
  - Ischaemic rest pain cannot be managed by analgesia or revascularization.
  - A life-threatening foot infection cannot be treated by other measures.
  - A non-healing ulcer is accompanied by a higher burden of disease than would result from amputation.
- Foot care education should be provided to the person with diabetes, family, and caregivers according to the risk of ulceration and amputation.
- The person with diabetes, family, and caregivers should be taught to inspect the feet on a daily basis with shoes and socks removed.
- Advice should be given about appropriate exercise in people with loss of foot sensation, previous ulcers, and foot deformities especially the avoidance of excessive weight bearing exercises.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Regular foot inspection is of even more important in individuals with limited ability to self-care.
- Ensure families and caregivers receive intensive foot care education.

Sub-category A: Frail

- The emphasis should be on maintenance of lower limb performance and minimizing pain.
- Surgical interventions should be considered in light of likely clinical benefit and require adequate pre-operative nutrition and a suitable post-operative rehabilitation package.

Sub-category B: Dementia

- Foot care requires a greater reliance on caregivers.

CATEGORY 3: END OF LIFE CARE

- Foot care remains an important aspect of management with an emphasis on prevention of pressure related problems and prompt attention to acute foot problems.
- Caregivers should receive foot care education.
- The threshold for investigations and invasive interventions should be high.

RATIONALE AND EVIDENCE BASE

Diabetic foot ulcer, PAD in the lower extremities, and limb amputation are more common in older adults with diabetes than in younger adults. They impair function and quality of life and increase the costs of care. Interventions to prevent and manage diabetic foot disease can maintain physical and social function. Antibiotic use, revascularization, and amputation have more risks when implemented in older adults and may have various physical and psychological sequelae. Individualized treatment options should aim to increase the level of benefit and minimize harm.

Because of the potential for improvement of health and reduction of healthcare costs, recommendations for diabetic foot care in general adults have been given in the recent guidelines of IDF and other authorities[8,203-205], based on extensively reviewed evidence available.

The basis of foot care is formal regular review to detect people at risk, more regular review of those found to be at risk, and intensive management of those developing foot ulceration and infection. The main risk factors for foot problems include a past history of foot ulcer or amputation, peripheral neuropathy, peripheral vascular disease, and foot deformity. Risk can be stratified according to the presence or absence of risk factors and risk classification schemes are generally similar across guidelines. Although assessment methods vary in their sophistication, accurate risk classification can be achieved with simple procedures available in routine primary care.

The foot assessment in older people with diabetes may poses additional problems related to variation in physical and mental functional limitations. The prevalence of PAD is very high (> 60%)[206]. However the assessment of vascular disease in older people with diabetes may be difficult. It is not unusual for ankle pressures to be normal but for toe pressures to be significantly decreased. Therefore, when clinically indicated, it is important to measure toe pressures. Arterial waveforms as well as segmental pressures help to indicate areas of arterial narrowing. Specific effort is required to diagnose and define the extent of PAD in all people with ulceration of the foot. When inadequate perfusion is identified, revascularization (endovascular or bypass) should be considered in all ambulatory people[205]. Revascularization should be considered on an individual basis with consideration of the likely effects of contrast nephropathy[207,208], peri-operative in-hospital complications[209], multiple surgery and/or prolonged hospital stay on functional status[210], and the mortality after surgical revascularization in the very elderly[211].

Older adults who are functionally and cognitively intact, and have significant life expectancy are recommended to receive diabetes care using goals developed for younger adults[138]. Foot amputations are delayed with effective management as recommended in current guidelines[212]. No evidence is available that demonstrates that formal regular review, foot care education, risk factors, risk stratification, footwear provision, and the multidisciplinary foot care team approach have significantly different effects between younger and older adults.

Antibiotic choice (including categories, dosage, and therapy duration) for the treatment of infection of a diabetic foot should be determined after full consideration of the side-effects and efficacy of antibiotics in older people[213].

A number of studies have showed that frailty is associated with negative outcomes after surgery in older people[214-216]. Very frail people may not tolerate well endovascular, bypass, or amputation surgery[205,210,217]. Further, it appears that there are still people with critical limb ischaemia who could benefit from non-surgical treatment if a tailored approach is used[210,218].

Diabetic foot care and wound healing is a major problem in people with dementia because they are unable to comply with treatment programmes and frequently pace or wander on injured feet. Education for people with dementia is often not feasible. Foot care education should focus on caregivers to improve the quality of life in people with dementia and decrease the burden of care.

The importance of wearing therapeutic shoes has been shown previously. One study showed that while people who wore therapeutic shoes had an ulcer recurrence rate of only 17%, those who returned to wearing regular shoes had an 83% recurrence rate[219].

The care of people with diabetic foot disease is not referred to in the Diabetes UK guideline on end of life care in diabetes[220]. Invasive treatment such as revascularization and amputation are not recommended to people as end of life care[205]. Evaluation of vascular insufficiency is not necessary if revascularization and amputation are not being considered. The effectiveness of educational programmes in reducing amputation has been well documented[221].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Regular feet assessment should be supported by local policy and be an important part of the comprehensive healthcare of older people with diabetes. Multidisciplinary care supported by a specialist team of health and social care professionals is the core of successful management of diabetic foot disease in older people. The success of the team approach in reducing amputations has been well documented. Even with the best care, amputation may become necessary and in these circumstances, the involvement of a skilled rehabilitation team will also be required.

Education of healthcare professionals, people with diabetes, and

caregivers is an integral component of prevention and management of diabetes related foot problems. Printed instructions for diabetic foot care are needed. Foot care instructions should be regularly reviewed with the person with diabetes (and caregivers).

EVALUATION AND CLINICAL AUDIT INDICATORS

Evaluation of the quality of diabetes foot care is by annual incidence of foot ulceration, hospitalization due to foot disease, foot ulceration healing rates within defined time-periods, revascularization, and amputation rates at different levels of the limb and mortality after revascularization or amputation with defined time-periods.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with diabetes with type 2 diabetes having at least one foot examination in the past year	Number of older people with diabetes with type 2 diabetes seen in the past year	Number of older people with type 2 diabetes having at least one foot examination in the past year as a percentage of the total number of older people with type 2 diabetes seen in the past year	Documentation and date of the most recent foot examination
All-cause mortality of older people with diabetic foot disease receiving revascularization or amputation in the first 6 months after their operation	Number of older people with diabetic foot disease receiving revascularization or amputation in the past year	Number of older people with type 2 diabetes who died (all causes) in the first 6 month after revascularization or amputation for diabetic foot disease in the past year	Documentation and date of the death of elderly receiving revascularization or amputation for diabetic foot diseases

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DIABETIC NEUROPATHY

RECOMMENDATIONS

GENERAL

- Older people with diabetes should undergo examination of the peripheral nerves at the initial visit and as part of the annual review using a 10 g monofilament or 128 Hz tuning fork; a biothesiometer (cut-off point for ulcer risk > 25 volts); or non-traumatic pin-prick.
- Management of older people with peripheral neuropathy includes:
  - Optimizing glucose control (*see Chapter 11: Glucose control management and targets*).
  - Regular foot care (*see Chapter 17: Diabetes foot disease*).
  - Pain relief (if indicated).
    - » Exclude other causes of pain in the limbs.
    - » A systematic, stepwise approach to different therapies with consideration of safety, tolerability, careful dose titration, treatment adherence, and adverse events.
    - » Therapeutic options include antidepressants (e.g. amitriptyline, duloxetine, venlafaxine - these may adversely affect stability, balance, and cause cognitive problems), analgesics (local, simple, and narcotic), anticonvulsants (e.g. pregabalin, sodium valproate), capsaicin cream, lidocaine patch, alpha-lipoic acid, isosorbide dinitrate topical spray, and transcutaneous electrical nerve stimulation.
    - » As part of a multi-therapy approach to pain relief, non-steroidal anti-inflammatory medications can provide a contribution to the management of musculoskeletal or joint abnormalities secondary to long-standing neuropathy provided there are no contraindications to their use.
- Consider the presence of gastroparesis if clinically indicated:
  - A definitive diagnosis for gastroparesis requires measurement of gastric emptying by scintigraphy.
  - Management consists of optimizing glucose control; maintaining adequate hydration and nutrition (small low fat/fibre meals); prokinetic medicines (metoclopramide, domperidone) or erythromycin for symptomatic gastroparesis.
- Consider the presence of neurogenic bladder in the presence of urinary retention and incontinence.
  - A definitive diagnosis requires an objective assessment of bladder emptying using ultrasound as part of an urodynamic evaluation.
  - Organize an individualized management programme to decrease incontinent episodes.
  - Intermittent catheterization may be required for the atonic bladder.
- Consider the presence of cardiovascular autonomic neuropathy (CAN) if clinically indicated.
  - Diagnose cardiovascular autonomic neuropathy by resting tachycardia and heart rate response to provocation tests (lying-standing, Valsalva, deep breathing), and by lying and standing blood pressure.
- Enquire about erectile dysfunction (ED) as part of the annual review.
  - The diagnosis is based on history and exclusion of endocrine conditions (consider measuring prolactin and testosterone).
  - The presence of ED should prompt a review of cardiovascular risk factors.
  - Treatment options include psychosexual counselling, hormonal therapy, pharmacotherapy, mechanical devices, and vascular surgery.
  - Phosphodiesterase type-5 (PDE5) inhibitors are the usual first-line therapy in the absence of contraindications.
  - Consider referral surgical management if PDE5 inhibitors are ineffective or contraindicated.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.

CATEGORY 2: FUNCTIONALLY DEPENDENT

Sub-category A: Frail

- Treatment approaches will in general be cautious and tailored to a prediction of likely benefits, use limited procedures for evaluation, and an optimal and safe dosage regime of therapeutic agents.

Sub-category B: Dementia

- Pain assessment is important and should be formally evaluated in people with neuropathy.
- Adequate pain management may lessen agitation and increase oral intake in demented people who are unable to explain their symptoms or ask for pain medicines.
- Opiates should be used with great care because they may produce confusion in older people with existing cognitive problems.

CATEGORY 3: END OF LIFE CARE

- Detailed assessment procedures are not usually warranted and conservative management is recommended.
- Pain relief remains an important consideration and pharmacotherapy indicated for maximum pain relief commensurate with acceptable side-effects and improvement of quality of life.

RATIONALE AND EVIDENCE BASE

Diabetes related neuropathy contributes not only to foot problems but also results in a range of troublesome symptoms including pain/paraesthesia and gastro-intestinal, bladder, and sexual problems.

Only a proportion of people with diabetic polyneuropathy have painful symptoms. Pain is often self-limited and resolution occurs over 12 months in approximately one half of people. It is important to consider and exclude other causes of pain in the limbs by careful assessment. The most common of these are claudication, Morton's neuroma, Charcot neuroarthropathy, fasciitis, osteoarthritis, and radiculopathy. Management of diabetic neuropathy requires treatment of the underlying disease (diabetes) and the treatment of the neuropathy itself. It is important to consider the safety and tolerability of different therapies for neuropathic pain. Dosages must be titrated based on positive response, treatment adherence, and adverse events.

The medical management of neuropathy for people with frailty and/or dementia or those in an end of life scenario poses many challenges. Intensive investigation and strict glucose control become less important but relief from pain and avoiding hypoglycaemia are paramount. In people with dementia, these measures can reduce the risk of agitation and confusion.

Aspects of neuropathy which do not relate directly to foot care have received increasing attention in evidence-based guidelines[8,138,222]. There is general agreement that stabilizing glycaemic control is important in the medium and longer term. The effect of hyperglycaemia on disease progression appears to be dose-dependent. In the Oslo Diabetes study, each 1% / 11 mmol/mol rise in HbA_{1c} was associated with a 1.3 m/sec slowing of nerve conduction at 8 years[223]. Exclusion of non-diabetic causes of neuropathy is important because these may account for 10% of cases of neuropathy in people with diabetes. Treatment options are expanding for painful neuropathy. Tricyclic medicines should be used as first-line therapy for painful neuropathy, although side-effects are common. The evidence base for direct comparison of different agents is limited[223]. A quantitative systematic review of randomized controlled trials of antidepressants or anticonvulsants for the treatment of diabetic neuropathy found both drug classes to be effective in reducing pain associated with the neuropathy[224]. Opiate analgesia (tramadol, oxycodone) either alone or in combination with other agents, can improve symptom control in individuals not controlled with other agents or monotherapy[222]. Treatment with oral alpha lipoic acid 600 mg once daily in people with symptomatic painful diabetic polyneuropathy who are refractory to or intolerant of antidepressants or anticonvulsants, may be of beneficial[222]. Electrical nerve stimulation is probably effective for reducing neuropathic pain and results in a modest improvement in pain on the visual analogue scale after 6 weeks[222,225].

There are a variety of manifestations of autonomic neuropathy

including gastroparesis, urinary retention and incontinence, ED, and CAN. Gastroparetic symptoms may improve with dietary changes and prokinetic agents such as metoclopramide or erythromycin. Although there is limited research on specific dietary changes for improving gastroparetic symptoms, recommendations for low-fibre and small, frequent meals, with a greater proportion of liquid energy has been helpful for some individuals[226]. Despite the relatively poor predictive value of symptoms, it is reasonable to suggest a trial of prokinetic therapy for about 4 weeks, rather than initially establishing the diagnosis by measurement of gastric emptying. Urinary retention and incontinence is common and cause a feeling of discomfort in older people with diabetes. Intensive glycaemic control can reduce the incidence of urinary retention and incontinence[222]. ED is also a common but often overlooked complication of diabetes, especially in older people. However, ED may greatly decrease quality of life. Therefore, specific enquiry should be included as part of the annual review and contributory factors reviewed. Treatment options include PDE5 inhibitors and other medical or surgical management. PDE5 inhibitors are the usual first-line therapy in the absence of contraindications[138]. CAN should be suspected by a resting tachycardia (> 100 bpm) or orthostatic reduction in blood pressure (a fall in SBP > 20 mmHg on standing without an appropriate heart rate response). It is associated with increased cardiac event rates[8,138].

Older people with frailty, functional disability, or multiple comorbidities are usually excluded from clinical trials which makes applying current evidence to clinical practice difficult.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Appropriate protocols should be developed for sensory testing and may include formal assessment using the neuropathy disability score. Healthcare professionals should be trained in the diverse manifestations of autonomic neuropathy and be aware of appropriate investigative procedures. Recommended medicines should be available.

EVALUATION AND CLINICAL AUDIT INDICATORS

Evaluation of quality diabetes neuropathy care is by having systems in place for regularly screening for peripheral neuropathy in both inpatient and community clinical sectors, assessing the annual incidence of confirmed neuropathy, neuropathy related foot ulceration and associated morbidities, and hospitalization due to severe neuropathic pain.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes assessed for neuropathy in the previous year	Number of older people with type 2 diabetes seen in the previous year	Number of older people with type 2 diabetes assessed for neuropathy in the past year as a percentage of the number of people with type 2 diabetes seen in the past year	Documentation and date of the most recent assessment

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SEXUAL HEALTH AND WELL-BEING

RECOMMENDATIONS

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Every older person with diabetes should be asked about sexual health and well-being when indicated and as part of the annual assessment.
- Provide opportunities for older people to discuss sexual health issues during routine consultations.
- People at risk of sexual health issues should have a comprehensive assessment to detect underlying physical, psychological, and social factors that compromise their sexual health and well-being.
- The information should be used to include an individualized sexual health component in the care plan.
- Older men with erectile dysfunction should have a comprehensive cardiovascular assessment before oral PDE5 inhibitors are prescribed.
- Consider testosterone replacement for men with documented testosterone deficiency and symptoms. Testosterone replacement is not indicated if symptoms are not present.
- If a sexual health problem is identified, provide or refer the person for appropriate counselling and management.
- The PLISSIT model is a useful framework for discussing and managing sexual health issues.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Aged care facilities should have education programmes and policies in place to help staff maintain older people's sexual health and well-being.

Sub-category A: Frail

- The principles are as for *Category 1: Functionally Independent* for people in this category who are engaged in sexual activity.
- Education programmes should encompass how to manage older people who make inappropriate sexual advances to staff, other residents, and who exhibit inappropriate sexual behaviour, rather than dismiss it as 'behaviours of concern'.

Sub-category B: Dementia

- The principles are as for *Category 1: Functionally Independent* for people in this category who are engaged in sexual activity.
- Caregivers should be instructed about the potential issues and problems that may arise about sexual disinhibition in certain types of dementia.

CATEGORY 3: END OF LIFE CARE

- Healthcare professionals must be aware that people in this category may wish to engage in modified sexual activity with their partner.
- To facilitate this important part of a relationship, it is important to manage symptoms and undertake a medicine review.

RATIONALE AND EVIDENCE BASE

Older people often have sexual health concerns but they frequently do not discuss them. Sexual health is a broad concept encompassing body image, self-esteem, romance, social relationships, sensual expression, and sexual behaviour[227]. Definitions of sexual health vary and often focus on sexual dysfunction. However, sexual health is a composite entity encompassing interest in sex, sexual functioning, satisfaction, health intimate relationships, and sexual self-esteem[228]. Sexual health is associated with physical benefits such as cardiovascular health, reduced sensitivity to pain[229], and psychological benefits such as reduced depression, overall self-rated quality of life, and self-esteem[230]. Lindau and Gavrilova[231] found older women with diabetes were less likely to be sexually active than older men with diabetes and non-diabetic older women in a large national cross-sectional survey. In addition, older men with diabetes reported more ED and orgasm problems than older non-diabetic men.

Sexual health is frequently overlooked in older people and sexual expression is often regarded as 'problem behaviour' in aged care homes. Frontal lobe dementias may present as sexual disinhibition. However, the most common presentation is loss of libido. Counselling is important. Other considerations include consent to sexual activity by the person with dementia, their vulnerability and the fact they may forget due to memory deficits.

Sexual health should be discussed with everyone with a chronic disease. It plays a significant role in successful ageing[232]. Most sexual health problems are multifaceted encompassing physical, medical, psychological, social, and relationship components that have cumulative effects in addition to the effects of comorbidities and intercurrent illnesses.

Common causes of sexual dysfunction in both genders include low libido, psychological causes such as depression and anxiety, relationship problems (including loss of a partner), neurological disorders such as cerebrovascular accidents especially in the left hemisphere, hormonal disorders, and metabolic disorders such as renal disease and cancer[227,233]. Pain and functional disabilities inhibit sexual enjoyment.

Some medicines also affect sexual health e.g. psychotherapeutic medicines; cardiovascular medicines such as beta-blockers, thiazide diuretics, digoxin, and clofibrate; chemotherapeutic agents; cimetidine and drugs of addiction such as nicotine and alcohol. In addition, opioids, narcotics, corticosteroids, anti-androgens, and immunosuppressant medicines can affect sexual health[234,235]. Hypo- and hyperglycaemia affect mood, sexual functioning, and spontaneity.

The PLISSIT Model[236] is a simple model that shows most people with sexual problems do not need an intensive course of treatment. Annon used the acronym PLISSIT to explain four basic forms of sex therapy: Permission (being open so the individual feels comfortable discussing sexual health issues), Limited Information (providing limited relevant information), Specific Suggestions, and Intensive Therapy (usually requires referral to a trained sex counsellor). Thus, the PLISSIT model is also useful for deciding the healthcare professional's level of knowledge and competence to undertake sexual health management and counselling.

The sexual health and well-being of older people can be compromised by a number of factors including stereotypical and ageist attitudes as well as the fact that healthcare professionals often feel uncomfortable discussing and do not proactively address such issues, especially with older people. Older people often need to reframe their sexual relationships and body image, for example when a partner dies or when they enter an aged care home. Significantly, all aged care homes should have sexual health policies, yet only approximately 20% actually do so[237].

Sexual health can be affected by medicines, functional and physical disabilities, and cognitive changes, hypo- and hyperglycaemia, autonomic neuropathy, CVD, untreated pain, intercurrent illness, alcohol consumption, and depression, these effects can be cumulative. ED is common in men with diabetes. Women with diabetes report vaginal dryness and sexual dissatisfaction.

Lower serum testosterone is associated with age related physical changes and affects quality of life and life expectancy. Changes associated with reducing testosterone are gradual and non-specific. Testosterone replacement for older men without symptoms and low testosterone is controversial and is generally not recommended[238]. Likewise testosterone replacement in men with prostate cancer is also controversial; if it is prescribed, the use should be monitored and dose adjusted according to the response, which should include monitoring sexual functioning, well-being, and serum testosterone. Low dose testosterone replacement is associated with low blood glucose, HbA_{1c}, fasting glucose, and cholesterol and improved quality of life in men with type 2 diabetes and metabolic syndrome[238]. The dose form of testosterone should be individualized.

Lifelong sexual functioning is regarded as a primary aspect of successful aging[239,240] especially as the 'baby boomers' are entering later life and have different views about ageing and sexual health than previous generations[241]. Later life divorce and remarriage age increasing as are intimate but non-cohabiting relationships among older people, as are gay and lesbian relationships and rates of sexually transmitted diseases including HIV/AIDS amongst people over 50 years (6% of female and 12% male new AIDS diagnosis)[241]. The US National Social Life, Health and Aging Project[233] found 73% of older adults aged 57-64 engaged in sexual activities, which is a similar rate to people aged 18-59.

Many older people regard sexual health as important to their quality of life and would like to discuss sexual health issues with healthcare professionals but usually do not because they worry about being seen as 'sexual at their age'[239]. Individual sexual dissatisfaction is associated with high risk of poor spousal health, diabetes, fatigue, male gender; whereas satisfactory marital support and spousal support enhanced sexual health[232]. Syme et al[232] also demonstrated that risk of inability to sustain a sexual relationship was independently associated with higher education, poor self-rated health, history of diabetes, prostate cancer, fatigue, sexual pain, and history of depression.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Key factors to improving this aspect of care focus on implement guideline recommendations, educate aged care staff about sexual health issues and how to manage them, maximizing sexual health for individuals, and ensuring each person has sexual health incorporated into their healthcare plan.

Processes need to be in place to ensure the individual can be referred for sexual health counselling if indicated or requested. The PLISSIT model should be used to help assess sexual health and well-being and determine when to refer the older person for counselling/ investigations.

EVALUATION AND CLINICAL AUDIT INDICATORS

The WHO and related international agencies published a list of 17 global indicators for monitoring reproductive health goals and targets. These indicators are grouped into five core elements of reproductive health, some are relevant to older people, and some encompass policy and social indicators, access and availability of services, service use, and output and impact indicators. A significant, relevant indicator is that healthcare professionals are trained to provide sexual counselling.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with diabetes who have had a sexual history screen in the previous year	Number of older people with type 2 diabetes seen in the previous year	Number of older people with diabetes who have had a sexual history screen as a percentage of all older people with diabetes seen in the previous year	Documentation and date of the most recent assessment

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20 - SPECIAL CONSIDERATIONS SECTION

20.1 - STROKE ILLNESS

RECOMMENDATIONS

GENERAL

- All older people with or without diabetes should have their blood glucose level measured on admission with acute stroke.
- History of diabetes or previous cerebral infarction should not be a contraindication to thrombolysis therapy.
- Consider antiplatelet therapy for people in sinus rhythm and anticoagulation for people with atrial fibrillation, provided there are no contraindications.
- Consider carotid endarterectomy or stenting in people with severe (> 70%) or symptomatic carotid stenosis.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Treat hyperglycaemia to keep blood glucose levels between 6.0-10.0 mmol/l (110-180 mg/dl) and ensure that hypoglycaemia is avoided.
- Management of lifestyle, dyslipidaemia, blood pressure, and blood glucose should be in accordance to *Chapter 8: Nutrition, physical activity, and exercise*, *Chapter 13: Management of dyslipidaemia*, *Chapter 12: Blood pressure management*, and *Chapter 11: Glucose control management and targets*.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Treat hyperglycaemia to keep blood glucose levels between 6.0-10.0 mmol/l (110-180 mg/dl) and ensure that hypoglycaemia is avoided.
- Management of lifestyle, dyslipidaemia, blood pressure, and blood glucose should be in accordance to *Chapter 8: Nutrition, physical activity, and exercise*, *Chapter 13: Management of dyslipidaemia*, *Chapter 12: Blood pressure management*, and *Chapter 11: Glucose control management and targets*.

CATEGORY 3: END OF LIFE CARE

- Treat hyperglycaemia to keep blood glucose levels between 6.0-15.0 mmol/l (110-270 mg/dl) and ensure that hypoglycaemia is avoided.
- A decision to treat with antiplatelet therapy or anticoagulation must be made after discussion with the person with diabetes, family, and caregiver with full consideration of the risks and potential benefits.

RATIONALE AND EVIDENCE BASE

Diabetes increases the risk of ischaemic stroke by two-fold[242]. On the other hand, acute ischaemic stroke can lead to acute disturbance in glucose metabolism affecting stroke outcome[243]. Furthermore, diabetes is associated with an increased risk of post stroke long-term functional impairment and dementia[244,245].

Hyperglycaemia occurs in about 30-40% of patients admitted with acute ischaemic stroke which may reflect pre-existing diabetes or stress hyperglycaemia[243,246]. Hyperglycaemia on admission (> 6.1 mmol/l [110 mg/dl]) is associated with poor outcome regardless of diabetes status[247]. The relative risk of in-hospital or 30 day mortality after an ischaemic stroke in individuals with hyperglycaemia but no history of diabetes is 3.3 (95% CI: 2.3-4.7) and in those with diabetes is 2.0 (95% CI: 0.04-90.1) compared with patients with normoglycaemia[243]. Therefore, tight glycaemic control could be indicated in acute stroke but evidence from clinical trials is still lacking[248]. In a meta-analysis of 1,296 patients with acute stroke intensively treated with intravenous insulin to maintain blood glucose level around 4.0-7.5 mmol/l (70-135 mg/dl), no difference in outcome was found compared with usual care (odds ratio 1.0, 95% CI: 0.8-1.3) but there was an increased risk of hypoglycaemia (odds ratio 25.9, 95% CI: 9.2-72.7) in the intensively treated group. However, patients were mostly treated for only 24 hours and a little difference in blood glucose level between both groups (0.57 mmol/l [10 mg/dl]) was achieved[249]. Therefore, it is still reasonable to control hyperglycaemia in acute stroke as we await more evidence.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Blood glucose should be measured in all people admitted with acute stroke. Hyperglycaemia should be treated with subcutaneous insulin but if glucose levels are persistently high, intravenous insulin infusion can be used initially for the first 24-48 hours. Consistent bedside glucose monitoring is necessary to avoid hypoglycaemia and to make appropriate adjustments to insulin regimens. In people on enteral tube feeding, intravenous insulin infusion can be used but a tailored subcutaneous insulin twice with daily regimen adjusted according to capillary glucose level has been shown to be effective[250]. A multidisciplinary approach involving stroke and diabetes clinicians to develop local protocols and training for comprehensive assessment and management of hyperglycaemia may be useful. HbA_{1c} should be checked. Oral anticoagulation should be considered in people with atrial fibrillation due to their high risk of recurrent stroke[251]. Integration of the palliative care team for people who have suffered a severe stroke and discussions with person and family regarding prognosis and early decisions about resuscitation is appropriate.

EVALUATION AND CLINICAL AUDIT INDICATOR

A survey of the number of older people with diabetes admitted to hospital with stroke would be useful. Post stroke functional outcome and institutionalization rate will give information about the burden of stroke in this age group. Annual comprehensive geriatric assessment should include assessment for stroke risk factors as well as screening for stroke symptoms as these seem to be under reported[252].

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with diabetes presenting with an acute stroke who have a blood glucose estimation at the time of admission	Number of older people with diabetes seen in the previous year with an acute stroke	Number of older people with diabetes and acute stroke who have had a blood glucose estimation at the time of admission as a percentage of the total number of older people with diabetes and acute stroke seen in the previous year	Documentation and date of the most recent assessment

20.1

20 - SPECIAL CONSIDERATIONS SECTION

20.2 - DEPRESSIVE ILLNESS

RECOMMENDATIONS

GENERAL

- Screening for and monitoring of depressive symptoms in older people with diabetes should be performed at diagnosis, be an integral part of standard diabetes care, and be part of the annual review.
- People with diabetes and caregivers should be taught to recognize early warning symptoms and signs of depression or a change in mood.
- Involvement of the family is essential to enhance socialization, communication, and support.
- Selective serotonin reuptake inhibitors should be considered as first line treatment of depressive illness.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Every effort should be made to avoid hypoglycaemia to reduce fear, anxiety and social isolation.
- Regular exercise should be considered to improve mood.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Provide physical or occupational therapy to maximize physical and mental function.

Sub-category A: Frail

- Mirtazapine should be used in people with weight loss and poor appetite when pharmacological treatment is indicated.

Sub-category B: Dementia

- Caregivers and family require additional education in recognizing and managing depressive illness.

CATEGORY 3: END OF LIFE CARE

- Alleviate chronic or severe pain.
- Consider the likelihood of depressive symptoms.
- Antidepressant therapy should be prescribed only after discussion with the person with diabetes and caregivers bearing in mind the time needed for therapy to have a positive effect.

RATIONALE AND EVIDENCE BASE

Depression is common and a life threatening morbidity in older people with diabetes. Although it has negative implications on all diabetes related clinical outcomes, it often remains under-diagnosed and under-treated. Identification and treatment of depression is likely to lead to overall risk reduction of diabetes complications and mortality.

More than a quarter of older people with diabetes suffer from depression[253]. The coexistence of depression with diabetes exerts a negative synergistic effect on the course of diabetes and contributes to poor compliance with medicine and diet, physical inactivity, poor glycaemic control, disability, and reduced quality of life[254-257]. It also independently increases all-cause and cardiovascular mortality (hazard ratio, 1.46; 95% CI: 1.29-1.66 and hazard ratio, 1.39; 95% CI: 1.11-1.73 respectively)[258]. Treatment of depression with antidepressants or psychotherapy improves mood and function but has little effect on glycaemic control which is likely to require simultaneous attention[259]. Regular exercise or walking programmes have been shown to improve mood and hyperglycaemia[260]. Avoidance of hypoglycaemia is important as its impact in the elderly is greater than in younger people. It can lead to increased fear, anxiety, and social isolation contributing to depressive symptoms[261].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Depression may be under diagnosed because people with diabetes and/or physicians are uncomfortable to discuss mental health issues or individuals may believe that low mood is a normal response to their illness. Therefore training healthcare professionals on the use of depression screening tools is essential.

Caregivers and people with diabetes should also be educated about early warning symptoms and signs of depression such as feeling sad or helpless. An integrated approach to management of depression and diabetes is needed through education and implementation of guideline-based treatment recommendations and monitoring adherence with medicines as these measures significantly improve both medical outcomes and depressive symptoms in depressed people with diabetes[262,263]. Therefore, service redesigns that support collaborative management strategies may improve the quality of care for depression in older people with diabetes.

EVALUATION AND CLINICAL AUDIT INDICATOR

Diabetes and depression have common symptoms such as fatigue, weight loss, change in appetite, and sleep disturbance. Therefore periodic assessment and monitoring for depression is needed for older people with diabetes. Several tools for assessing depression are available (*see Table 1 in Chapter 5: Assessment and evaluation procedures for older people with diabetes*) including the 9-item Patient Health Questionnaire (PHQ-9) and the short form or the 5 item version of the Geriatric Depression Scale[16,264,265]. Regular audits of screening for depression should be done at the initiation of treatment, when indicated, and monitored.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with diabetes who have received a screen for depression in their annual review during the previous year	Number of older people with diabetes seen in the previous year	Number of older people with diabetes who have had a screen for depression as a percentage of the total number of older people with diabetes seen in the previous year	Documentation and date of the most recent assessment

20.2

20 - SPECIAL CONSIDERATIONS SECTION

20.3 - HYPOGLYCAEMIA

RECOMMENDATIONS

GENERAL

- Healthcare professionals caring for older people with diabetes should assess each individual's risk of hypoglycaemia and develop an individualized care plan including a blood glucose range to minimize risk.
- In routine clinical practice, avoid blood glucose levels below 6.0 mmol/l 9110 mg/dl).
- An HbA_{1c} < 7.0% / 53 mmol/l should be used as a warning of *possible* overtreatment.
- Every person on insulin and certain sulfonylureas should have a hypoglycaemia management plan that includes blood glucose monitoring.
- An episode of severe hypoglycaemia should trigger a detailed diabetes review including a structured medicine review.
- An education strategy should be developed and implemented for healthcare professionals and people with diabetes to minimize the risk of hypoglycaemia and its consequences.
- A hypoglycaemia management kit should be readily available in hospitals and should be restocked immediately after use.
- Every person who is self-administering insulin should have an evaluation of their self-administration abilities.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Healthcare professionals should be particularly vigilant about hypoglycaemia when aiming for tight blood glucose control.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Preferentially prescribe glucose lowering agents with lower hypoglycaemic potential wherever possible and when not contraindicated.
- Caregivers and family should receive education about the recognition and treatment of hypoglycaemia.

Sub-category A: Frail

- Community dwelling frail people should have an SOS call programme established.

Sub-category B: Dementia

- A hypoglycaemia management kit should available for caregivers and family.

CATEGORY 3: END OF LIFE CARE

- Consider withdrawing glucose lowering therapies with a higher risk of hypoglycaemia.
- Caregivers and family should receive education about the recognition and treatment of hypoglycaemia, especially for those who may still be on insulin.
- Hospices and palliative care units should have a hypoglycaemia management kit readily available and restocked immediately after use.

RATIONALE AND EVIDENCE BASE

Hypoglycaemia includes all episodes of an abnormally low plasma glucose concentration (with or without symptoms) that expose an individual to harm[266]. For the purposes of this *Guideline* it is defined biochemically by a blood glucose level < 4.0 mmol/l (70 mg/dl).

Older people are at an increased risk for adverse medicine related adverse events from most medicines due to age related changes in pharmacokinetics (especially renal elimination) and pharmacodynamics (increased sensitivity). These changes may result in increased risk of hypoglycaemia [5]. Some medicines are classified as high risk due to their hypoglycaemia potential, especially insulin and sulfonylureas. The recently updated Beer's List of medicines that are best avoided in aged care homes specifically indicates that sliding insulin scales and long acting sulfonylureas should be avoided[114].

Age also appears to affect counter regulatory responses to hypoglycaemia in non-diabetic people. During clamp studies, symptoms begin at higher glucose levels and have greater intensity in younger men (aged 22-26 years) while measures of psychomotor coordination deteriorate earlier and to a greater degree in older people (aged 60-70 years)[267]. Studies in older people with diabetes are limited but one small study compared responses to hypoglycaemic clamps in older (mean age 70 years) versus middle aged (mean age 51 years) people with type 2 diabetes. Hormonal counter regulatory responses were similar in the two groups but middle-aged participants had a significant increase in autonomic and neuroglycopaenic symptoms at the end of the hypoglycaemic period while the older ones did not. Half of the middle-aged participants, but less than 10% of older participants correctly reported that their blood glucose was low during hypoglycaemia[268].

Neuroglycopaenic symptoms are more prevalent in older people[266] and can be mistaken for cognitive decline. Immediate and delayed verbal and visual memory and working memory are all affected by hypoglycaemia[269]. Many older people with diabetes have several complications and other comorbidities which can exacerbate or be exacerbated by hypoglycaemia[270] and are at higher risk of geriatric syndromes including falls and depression. All of these issues compromise independence, functional ability, and safety.

The prevalence of hypoglycaemia in older people with diabetes is unknown [5]. In the ACCORD trial, older participants in both of the glycaemic intervention arms had approximately 50% higher rates of severe hypoglycaemia (defined as requiring third party assistance) compared with participants under 65 years of age[86]. Other studies show that hypoglycaemia is associated with a two-fold increased risk of death in people over 70 years during hospitalization[271]. Symptomatic mild and severe hypoglycaemia is associated with increased risk of cardiovascular events, all cause hospitalization, and all-cause mortality[272].

Risk factors for hypoglycaemia in older people with diabetes include:

- Longer duration of diabetes.
- Insulin treatment and some sulfonylureas.
- Polypharmacy.
- Antecedent hypoglycaemia.
- Erratic meals, insufficient carbohydrate, and meals not timed to coincide with glucose lowering therapy administration.
- Inability to go shopping or diminished meal preparation competency.
- Exercise/unusual activity (which can include walking/wandering and other activities offered in aged care homes).
- Renal impairment.
- Liver impairment.
- Cognitive impairment.
- Malabsorption and swallowing problems.
- Blocked percutaneous endoscopic gastrostomy (PEG) feeding tubes.

In a population analysis of Medicaid enrolees treated with insulin or sulfonylurea therapy in the US between 1985 and 1989[273], the incidence of severe hypoglycaemia defined as leading to emergency department visit, hospitalization, or death, was around 2 per 100 person years. Independent risk factors for severe hypoglycaemia included hospital discharge within the previous 30 days, advanced age, black race, and using five or more concomitant medicines (polypharmacy).

Where the risk of hypoglycaemia is moderate (long duration of diabetes, renal impairment, recent hospital admission) or high (previous history of hypoglycaemia, frailty combined with multiple comorbidities, or aged care home residency), glucose lowering therapies with lower hypoglycaemic potential should be prescribed wherever possible and when not contraindicated [4].

20.3

Hypoglycaemia and the associated fear of hypoglycaemia affect mental health and quality of life and often contribute to depression[274]. It can also affect socialization and driving competence as well as activities of daily living, learning and self-care capacity. Falls are a significant associated risk.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

These recommendations require implementing in both secondary and primary care settings. Hypoglycaemia risk identification in people and hypoglycaemia education programmes for healthcare professionals should be part of the routine care of older people with diabetes and extend across the community and care facilities. Care homes, hospices, and mental health facilities should have a diabetes policy including a protocol on hypoglycaemia avoidance and treatment. Healthcare professionals and aged care home staff should receive specific educational guidance on hypoglycaemia.

EVALUATION AND CLINICAL AUDIT INDICATORS

Audits of emergency admissions for diabetes related hypoglycaemia should be routine in major hospitals. Access to education on hypoglycaemia for people with diabetes, caregivers and family should be monitored. An HbA_{1c} < 7.0% / 53 mmol/l has been propose as a threshold measure of potential overtreatment of older people who are at high risk for hypoglycaemia[275]. Hypoglycaemia risk and HbA_{1c} result could be obtained from the database or medical record.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes who have had a medicine review after a documented hypoglycaemic episode in the past year	Total number of older people with type 2 diabetes who have had a documented hypoglycaemic episode in the past year	Number of older people with type 2 diabetes who have had a medicine review following a hypoglycaemic episode as a percentage of all older people with type 2 diabetes who have had a documented hypoglycaemic episode in the past	Date and time of documented assessment
Percentage of staff and caregivers who have participated in a hypoglycaemia education programme in the past year	Total number of staff and caregivers who were eligible to participate in a hypoglycaemia education programme in the past year	Number of staff and caregivers who have participated in a hypoglycaemia education programme as a percentage of the total who are eligible to participate in the past year	Date and time of participation in educational programme

20 - SPECIAL CONSIDERATIONS SECTION

20.4 - HYPOGLYCAEMIC EMERGENCIES

RECOMMENDATIONS

GENERAL

- Aim for glycaemic goals that minimize severe hyperglycaemia and reduce the risk of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemic state (HHS).
- Both medical and non-medical teams should receive training in the recognition of risk factors for and the management of hyperglycaemic emergencies in older people.
- The presence of either DKA or HHS should be established by appropriate laboratory investigations and treated according to standard guidelines.
- Transitions between home and hospital should be done with the involvement of family, caregivers, and inpatient care team to ensure patient safety.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Hyperglycaemic emergencies in dependent people require the same urgency as the functionally independent.

Sub-category A: Frail

- Transition from hospital to home or to long-term care facilities must ensure adequate written and oral communication with family, caregivers, and the institutional care team to avoid risk of treatment errors and recurrence of hyperglycaemia.

Sub-category B: Dementia

- Caregivers and family must receive education about how to recognize unacceptable hyperglycaemia and the warning signs of a hyperglycaemic emergency.

CATEGORY 3: END OF LIFE CARE

- The decision to admit to hospital a patient with a hyperglycaemic emergency who is at the end of life must be made with full discussion and liaison with the family and healthcare team.

RATIONALE AND EVIDENCE BASE

Hyperglycaemic emergencies can result in hospitalization, wide morbidity, and increased mortality in older people with diabetes despite advances in our knowledge of the pathogenesis, risk factor identification, and standardization of management approaches[7].

Three levels of interrelated hyperglycaemic emergencies might occur in older people:

- **Symptomatic hyperglycaemia:** People with known or unknown diabetes may present with symptoms of fatigue and lethargy. Weight loss may occur. The classical osmotic signs of hyperglycaemia, such as polyuria, nocturia, and thirst may or may not be present in older individuals. Laboratory investigations will show high levels of plasma or capillary glucose. Glycosuria may not be detected due to an elevated renal threshold for glucose seen in the elderly [4].
- **Diabetic ketoacidosis:** This is unusual in the elderly but is important since the associated mortality rate is high. Together with an exacerbation of the signs and symptoms of hyperglycaemia, the additional features of vomiting, abdominal pain, tachycardia, hypotension, altered mental status, and Kussmaul breathing may be present. Laboratory tests will include the presence of a metabolic acidosis, ketonaemia, and hyperglycaemia [8].
- **Hyperosmolar hyperglycaemic state:** HHS is a life-threatening complication that traditionally occurs in older functionally compromised people with multiple medical comorbidities. Management varies between different clinical admitting teams as adherence to guidelines can be poor, and often this serious complication is managed by non-specialist teams. It presents with confusion and/or reduced consciousness and neurological symptoms connected with cerebral oedema such as seizures. The degree of hyperglycaemia is marked with plasma glucose levels usually above 30.0 mmol/l (540 mg/dl). Severe dehydration and hyperosmolality (> 320 mmol/l) are features, in the absence of significant acidosis[8,66,276]. The first 24 hours of treatment can be labour-intensive and it has been suggested that this should take place in a medical intensive care unit or in a monitored bed in a well-staffed acute admissions unit[277]. Serial calculations of serum osmolality to monitor response to treatment and to avoid over-rapid fluid corrections of the biochemical derangements are recommended. These rapid shifts in osmolality have been implicated in the often fatal complication of cerebral pontine myelinosis and cerebral oedema. These complications may be reduced by the initial treatment with 0.9% sodium chloride solution and that insulin is only introduced when the fall of plasma glucose has plateaued.

Precipitating factors for hyperglycaemic emergencies in older people include:

- Comorbidities: infection, cardiovascular events, renal failure, trauma, surgery, burns, and starvation.
- Medicines: corticosteroids and diuretics.
- Impaired thirst perception, reduced free access to fluids, and inadvertent administration of high glucose drinks.
- Most advanced age-groups residence in an aged care home[66].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

These recommendations require implementing in secondary, primary, and community care settings including hospices, mental health facilities, and palliative care units. Hyperglycaemia risk identification in people and hyperglycaemia education programmes for healthcare professionals should be part of the routine care of older people with diabetes and extend across the community and care facilities. Care homes, hospices, and mental health facilities should have a diabetes policy including a protocol on prevention and early detection of hyperglycaemic emergencies. Healthcare professionals and aged care home staff should receive specific educational guidance on hyperglycaemia.

EVALUATION AND CLINICAL AUDIT INDICATORS

Audits of emergency admissions for diabetic hyperglycaemic emergencies should be routine in major hospitals. Access to education on significant hyperglycaemia for people with diabetes, caregivers, and family should be monitored.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes and an emergency room presentation due to hyperglycaemia who have been included in an annual audit	Number of older people with type 2 diabetes and an emergency room presentation due to hyperglycaemia seen in the previous year who are eligible for inclusion in the audit	Number of older people with type 2 diabetes and an emergency room presentation due to hyperglycaemia as a percentage of the total numbers seen who are eligible for inclusion in the audit	Documentation and date of the most recent audit

20 - SPECIAL CONSIDERATIONS SECTION

20.5 - FALLS

RECOMMENDATIONS

GENERAL

- All older people with diabetes should have an assessment of their fall risk during the initial visit, annual review, and if there is a recent history of a fall.
- Offer education and a fall prevention programme to those with high risk of falls or recent history of falls.
- Provide education to all older people with diabetes about fall prevention.
- If possible discontinue unnecessary and problematic medicines especially those with increased risk of falls such as psychotropic drugs and narcotics.
- Assess vision regularly and provide correction as needed.
- Home safety should be regularly checked and modified as needed.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Consider a referral to an appropriate healthcare professional to receive endurance, gait, balance, and strength training.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Minimize risk of hypoglycaemia by avoiding tight glycaemic control.
- Provide interventions to enhance endurance, gait, balance, and strength training.
- In collaboration with the person with diabetes and their family, undertake home safety checks and modifications as required.

Sub-category A: Frail

- Arrange domiciliary visual assessment where possible and provide correction as needed.

Sub-category B: Dementia

- Caregivers and family members of older people with diabetes and dementia should receive education and training on falls prevention.

CATEGORY 3: END OF LIFE CARE

- Principal caregivers and family members should receive training in prevention of falls.
- In collaboration with the person with diabetes and their family, undertake home safety checks and modifications as required.
- Undertake a review of medicines and consider withdrawing all potentially inappropriate medicines.

RATIONALE AND EVIDENCE BASE

Falls are a leading cause of morbidity and mortality in older people and associated disability and declined quality of life are one of the greatest challenges facing the frail older population. Older people with diabetes are at high risk of falls, recurrent falls, and fractures[278-280].

Risks factors for falls in older persons with diabetes include polypharmacy, muscle weakness, previous stroke, motor and sensory neuropathy, poor glycaemic control, hypoglycaemia, insulin use, cognitive dysfunction, orthostatic hypotension, and visual impairment[281-283]. Lower HbA_{1c} (< 7.0% / 53 mmol/mol) has been associated with higher risk of falls frail elderly people[284] and hip fracture[285], especially in those treated with insulin[282]. Measurement of gait velocity and ankle muscle strength have been used to identify people at risk of falling[286]. Many studies using gait, balance, and strength training have shown reduced risk of falls for people with diabetes[287-300].

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

All health and social care professionals should have access to education about falls, and every effort should be made to provide education about falls to people with diabetes, caregivers, and family. Systems should be in place in the diabetes care pathway to include falls assessment and referral to specialist advice. Ideally rehabilitation should be available to deal with gait and balance disorders.

EVALUATION AND CLINICAL AUDIT INDICATORS

Emergency room, primary care, and specialist service audits of numbers of older people with diabetes presenting with a fall, and numbers of fallers should be assessed. Asking about a falls history in the annual review and having referral mechanisms to for assessment and treatment of fallers will provide key datasets.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes presenting with a fall in the past year	Number of older people with type 2 diabetes presenting with a fall in the past year	Number of older people with type 2 diabetes presenting with a fall as a percentage of the total number of people with type 2 diabetes seen in the past year	Documentation and date of the most recent assessment

20 - SPECIAL CONSIDERATIONS SECTION

20.6 - ASSESSMENT OF PAIN

RECOMMENDATIONS

GENERAL

- Clinicians should undertake a detailed assessment of pain risk as part of the annual review.
- People at moderate to high risk of pain should have their current pain level assessed using an appropriate pain assessment tool.
- Identify the cause of pain with particular attention to diabetes related factors that contribute to pain - peripheral neuropathy, periodontal disease, depression, falls, trauma, and skin tears.
- Develop a pain management plan for people at increased pain risk or in pain.
- An analgesia plan should use the least invasive administration route and the lowest effective dose and should consider non-medicine pain management strategies (e.g. massage, exercise, Tai Chi, yoga, bed cradles, music therapy).
- Chronic pain should be treated with regular doses of analgesia.
- Review the medicine regimen to determine whether medicine related side-effects could be contributing to the pain.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- All general recommendations apply to this category.
- Stabilise glucose levels to the target range (*see Chapter 11: Glucose control management and targets*) as hyperglycaemia may exacerbate pain.
- Provide advice on the suitability of driving while on pain management medicines.
- Consider referral to a physiotherapist to recommend an appropriate activity plan.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- People in this category require recommended pain assessment and management strategies.

Sub-category A: Frail

- Balance less rigid glucose targets with possible increased pain levels in hyperglycaemic states.
- Support people with painful joint or locomotor disorders to continue exercising to reduce disability by an appropriate analgesia programme.
- During active pain management, keep side-effects of therapy to a minimum in order to maintain functional status.

Sub-category B: Dementia

- In view of likely communication problems, every effort should be made to be proactive in using simple pain tools or self-report questionnaires.
- Health and social care professionals should be trained to recognize the features of pain in people unable to communicate freely.
- Caregivers and family should be provided with education about the detection of pain in people with cognitive problems and how to seek assistance in pain management.

CATEGORY 3: END OF LIFE CARE

- Over investigation of the aetiology of pain should be minimized.
- Attempt to maintain the person pain-free throughout the 24 hour cycle.
- Use sufficient but acceptable pain relief strategies to minimize anxiety and avoid unnecessary stress.
- Educate family and caregivers about the side-effects of analgesic medicines.

RATIONALE AND EVIDENCE BASE

Pain is common and often undetected in older people and older people are at increased risk of pain and the pain is often chronic. People in pain are at increased risk of falling and other adverse events. People with diabetes are at increased risk of all types of pain including 'silent pain' from myocardial infarction and urinary tract infections. Pain is often under-reported and under-treated in many older people with diabetes and is particularly prevalent in people with long duration of diabetes. Changes in body language, grimacing, restlessness, increased wandering, crying out, groaning, hypertension, tachycardia, and rapid shallow breathing may be indications of pain. Pain can be acute, chronic, or intermittent. Managing pain in older people is a key aspect of the national strategies for all healthcare settings[22,291].

Pain is defined as 'a subjective, unpleasant sensory, and emotional experience of actual or potential tissue damage'[292,293]. Pain is always subjective. It is important to distinguish between acute and chronic pain. Chronic and recurrent pain is often associated with depression and affects quality of life and social, psychological, and physical functioning, with implications for self-care and independence. Significantly, older people often under-report or do not report the sensory and affective components of pain and attribute pain to other things including age[294]. Some people deny pain out fear (e.g. having to go into hospital) and some do not disclose their pain because healthcare professionals do not ask about it. Consequently even serious problems (e.g. silent myocardial infarction and peritonitis) may not be recognized or reported[294]. Assessment of pain is not straightforward but a number of key instruments have been designed to bring objectivity to this area (Table 3).

More than 20% of people over 65 years experience persistent pain which affects their quality of life[295]. Pain becomes more prevalent with increasing age: 30% of women aged 80-84 years have pain and 80% of these are under-treated. Peripheral neuropathy occurs in up to 50% of people with long duration of diabetes and is associated with increased morbidity and mortality[296,297] and is often not reported. Significantly, 80% of older people who do report pain have moderate to severe pain and lower quality of life[298]. A recent study in aged care home residents found 23% with documented pain did not have scheduled analgesia prescribed and those with cognitive impairment were less likely to receive analgesia[299]. Recently, changes in brain grey matter density and cortical thickness have been linked to chronic pain[300] but the clinical significance of the finding is unclear.

Pain is costly and the costs are expected to increase throughout most of the world. Pain management is a fundamental human right[301]. In addition it represents a significant caregiver burden that is difficult to quantify.

Pain may present atypically[302,303]. Physical consequences of pain include:

- Respiratory changes e.g. unable to take a deep breath or cough which increase the risk of chest infection and delays recovery.
- Increased cardiovascular sympathetic activity which can lead to hypertension, tachycardia, and myocardial ischaemia especially if the person has pre-existing CVD and can increase the risk of venous stasis and pressure ulcers.
- Gastrointestinal pain can affect gastric emptying and intestinal motility, lead to erratic blood glucose levels, nausea, vomiting, and constipation.
- Depression, sleep deprivation, and worry[303,304].

It is important to appropriately classify pain (e.g. acute, chronic, postoperative) to adequately manage it and reduce the associated risks such as falls and behavioural changes. Managing pain reduces behavioural problems and agitation and enables antipsychotic medicine doses to be reduced or de-prescribed[305]. Management must be tailored to the individual and consists of non-medicines as well as medicines or a combination of both. A nutritious diet to avoid nutritional deficiencies that contribute to pain and keeping active to avoid muscle wasting are important management strategies. Non-medicine options often enable lower medication doses to be used and options include cognitive behavioural therapy, relaxation therapies, mediation, transcutaneous electrical nerve stimulation (TENS), heat/cold, exercise, hydrotherapy, massage, acupuncture, and complementary and alternative medicines (e.g. glucosamine)[22,293].

Pain management is different in older people. It consists of paying meticulous attention to detail and undertaking thorough and regular pain assessments[294]. The 1990 WHO analgesic ladder is a useful decision aid as are the Beer's criteria[114]. Generally, commence with mild analgesics such as paracetamol and non-medicine options. Non-steroidal anti-inflammatory medications can be useful for inflammatory pain but older people are sensitive to this class of medicines. Mild opioids such as codeine and tramadol can be used depending on the type of pain or a combination of medicines. Strong opioids may be needed at the end of life to promote comfort[306].

Tricyclic antidepressants are often used for neuropathic pain but can cause dry mouth, confusion, postural hypotension, urine retention, and exacerbate or cause glaucoma, especially in frail older people. Likewise, antiepileptic medicines are effective for neurological pain, but older people may have unpredictable responses. Common side-effects are gastrointestinal tract bleeding, fluid retention, hypertension, and interact with diuretic blood pressure effects of frusemide and thiazide diuretics[306].

Some older people benefit from lipoic acid 600mg four times per day but the evidence is not strong[307]. Local analgesics such a lidocaine patches and corticosteroids may be useful. The latter cause muscle wasting and hyperglycaemia, which might outweigh benefits.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

Pain risk assessment and the use of pain assessment tools should become more frequently used in routine diabetes care services. Training and education of healthcare professionals in the detection and treatment of pain should be more widely implemented. The needs of vulnerable people who are more likely to be at increased risk of pain, such as those in aged care homes or hospices, must always be met.

EVALUATION AND CLINICAL AUDIT INDICATORS

Medical records/case notes should routinely document pain screening. The annual review process should include use of pain screening tools. Residents of aged care homes and people with dementia or frailty should have proactive pain assessment.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of older people with type 2 diabetes who have been screened for pain risk during the previous year	Number of older people with type 2 diabetes presenting with a fall in the past year	Number of older people with type 2 diabetes presenting with a fall as a percentage of the total number of people with type 2 diabetes seen in the past year	Documentation and date of the most recent assessment

Table 3. Options for assessing pain

Assessment domain	Suggested assessments	Comments
Self-report: if the individual indicates they are in pain - accept they are in pain	Ask relevant questions (pain history) and use a pain screening tool	Self-report is regarded as the gold standard[308] Listen carefully for words people use to describe their pain e.g. sore, hurting, a bit uncomfortable Many older people are stoic about their pain
Document a comprehensive pain history and physical examination including neurological and functional status, cognition, and current and past pain management strategies and medicines	Information from the individual and/or their family or caregivers	Make sure the individual has sensory aids such as glasses and hearing aids and any written information is in a suitable font size and colour contrast, language and literacy level
Assesses the type of pain: nociceptive, neuropathic, cancer, psychological, mixed or unspecified		Knowing the type of pain is important to determining treatment strategies
Assess the possible effects on mobility, falls risk, nutrition, delirium, depression, and medicine related adverse events		

Pain assessment tools include:
 	
• **Multidimensional tools:**
  ○ Short-form McGill Questionnaire
  ○ Brief Pain Inventory
  ○ Geriatric Pain measure
  ○ Pain Disability Index
  ○ Multidimensional Pain Inventory
• **Unidimensional tools**
  ○ Numeric Rating Scale
  ○ Visual Descriptor scale
  ○ Pain Thermometer
  ○ Visual Analogue Scale
  ○ Pictorial Pain Scale (Faces Pain Scale)
• **Pain scales for people with dementia**
  ○ Pain Assessment Checklist for Seniors with Limited Ability to Communicate
  ○ Pain Assessment in Advanced Dementia
  ○ Abbey Pain Scale
  ○ Non-Communicating Patient's Pain Assessment
		The tool must be culturally relevant and suit the individual's literacy and numeracy capacity and their capacity to communicate verbally
		
		Getting to know the individual and involving family and caregivers in the assessment can be helpful

20.6

20 - SPECIAL CONSIDERATIONS SECTION

20.7 - DIABETES IN AGED CARE HOMES

RECOMMENDATIONS

GENERAL

- On admission to an aged care home all residents should:
  - Be assessed for undiagnosed diabetes.
  - Have a thorough holistic assessment which should be repeated annually as well as with any change in treatment or when the person's condition changes. The assessment should include testing of cognitive function, falls risk, hypo- and hyperglycaemia, pain, medicine related adverse events, and foot problems.
- Each aged care home should:
  - Undertake a risk-benefit analysis on all its residents at regular intervals that encompass medicines and metabolic targets, and the extent of investigations and interventions likely to confer benefit.
  - Annually screen for diabetes in all its residents.
  - Have a diabetes care policy and procedures which conform to regulatory requirements and meet evidence-based standards.
  - Have a hypoglycaemia kit available that is well stocked and up-to-date.
  - Consider having one or more designated staff members responsible for maintaining a high standard of diabetes care within the home.
- Provide staff with education about diabetes relevant to caring for older people with diabetes.
- Each person with diabetes should have an individual care plan which takes into account the person's wishes and health status. The care plan should include :
  - Nutrition (*see Chapter 8: Nutrition, physical activity, and exercise*).
  - Physical activity and exercise (*see Chapter 8: Nutrition, physical activity, and exercise*).
  - Medicine regimen and provisions for regular medicines review with a view to deprescribing where indicated, and consideration of non-medicine options.
  - Clinical targets (*see Chapter 11: Glucose control management and targets, Chapter 12: Blood pressure management,* and *Chapter 13: Management of dyslipidaemia*).
  - Monitoring of blood glucose according to glucose lowering treatment and risk of hypo- and hyperglycaemia (*see Chapter 20-3: Hypoglycaemia* and *Chapter 20-4: Hyperglycaemic emergencies*).
  - Documentation of risk assessments and strategies to reduce risks such as hypo- and hyperglycaemia, falls and pain (*see Chapter 20-5: Falls* and *Chapter 20-6: Assessment of pain*).
  - Diabetes education (*see Chapter 9: Education, diabetes self-management, and self-monitoring of blood glucose*).
  - Annual diabetes and general health review.
- End of life care planning, where relevant.
- Involvement of family and other caregivers in care decisions and providing care where relevant.
- Effective communication and referral strategies.

CATEGORY 1: FUNCTIONALLY INDEPENDENT

- Appropriately manage blood glucose (*Chapter 11: Glucose control management and targets*) and blood pressure (*Chapter 12: Blood pressure management*).
- Self-care capacity and knowledge should be assessed.
- Regular assess for a change in mood status/depression.
- Encourage independence including blood glucose monitoring and medicine self-management.
- Encourage participation in social activities.

CATEGORY 2: FUNCTIONALLY DEPENDENT

- Appropriately manage blood glucose (*Chapter 11: Glucose control management and targets*) and blood pressure (*Chapter 12: Blood pressure management*).
- Ensure proxy decision-making processes are in place.

Sub-category A: Frail

- Promote comfort and quality of life and reduce the risk of hypo- and hyperglycaemia and their consequences.
- Ensure a nutritional plan that maintains weight and muscle mass.
- Encourage the individual to participate in self-care but provide support where needed.

Sub-category B: Dementia

- Specifically educate and train care staff to support residents with diabetes and mental health problems.
- Ensure a nutritional plan that prevents unnecessary weight loss.
- Where possible use non-medicine options to prevent or manage behaviours of concern.
- Depression should be identified and appropriately managed.

RATIONALE AND EVIDENCE BASE

Older people in aged care homes are vulnerable and frequently rely on nurses and other staff for their care needs. There are misconceptions about providing diabetes care for older people with diabetes in aged care homes for example, that hyperglycaemia is unimportant because the focus is not on preventing long-term complications or achieving optimal metabolic control. Several important management problems are found in aged care homes such as nutritional deficiency and weight loss, increased risk of hypoglycaemia, high infection rates, and leg and foot ulceration[309]. The focus should be on safety, comfort, quality of life and proactive, preventative care. This should be reinforced by maintaining functional status and avoiding unnecessary admission to hospital for diabetes related issues. Care staff working in aged care homes should be supported, if possible, by community-based specialist teams.

Diabetes is highly prevalent among aged care home residents[310,311] and a high prevalence of detected and previously undetected diabetes is also seen in mental healthcare homes[312]. Many cases of diabetes are undiagnosed leaving already vulnerable people at risk of undetected diabetes complications developing. Residents with diabetes have a high level of comorbidity, disability, and frailty and a shortened survival[313,314] and are at risk of significant polypharmacy[315].

There is limited evidence on which to base diabetes care recommendations in aged care homes. Sinclair AJ et al[316] demonstrated the value of educating residents with diabetes in aged care homes. National guidance is available in some countries[317,318] specifically on managing older people with diabetes in residential and other aged care settings. These guidelines are based on a combination of best available evidence and consensus opinion as well as interviews with older people with diabetes, aged care home staff, and caregivers.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

The guideline implementation strategy must involve key staff in each aged care home and may include a process evaluation to identify the contextual factors that facilitate or are barriers to implementation. Education of aged care home staff and the interdisciplinary team on managing the older person with diabetes is essential. However, the definition and provision of aged care homes and aged care facilities varies enormously across the globe and standardizing approaches to care such as diabetes management templates would be challenging. The national guidelines described above in the Rationale and Evidence Base section of this special considerations chapter provide potentially suitable templates for diabetes policies and individualized care plans for residents with diabetes. National regulation may be required to maintain high standards of diabetes care in aged care homes.

EVALUATION AND CLINICAL AUDIT INDICATORS

Care homes should undertake regular audits which examine educational and training programmes for care staff and the implementation of a specific diabetes care policy. Data on numbers of residents with diabetes who are admitted into hospital or have a foot ulcer diagnosed would form part of the metrics. Data on frequency and severity of hypoglycaemia would also be useful information as would hypoglycaemia prevention policies for those on insulin therapy.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of residents with type 2 diabetes in the aged care home with an individualized diabetes care plan	Number of residents with type 2 diabetes in the aged care home	Number of residents with type 2 diabetes and an individualized care plan as a percentage of the total number of residents with type 2 diabetes	Diabetes-specific care documented in each person's care plan and the date of review documented
Number of newly admitted residents screened for diabetes	Number of newly admitted residents	Number of newly admitted residents who were screened for diabetes as a percentage of the total number of residents admitted	Screening documented in care plans

20 - SPECIAL CONSIDERATIONS SECTION

20.8 - END OF LIFE CARE

RECOMMENDATIONS

GENERAL

- Proactively plan palliative and end of life care in those with limited life expectancy in collaboration with the person with diabetes (and family/carers where relevant).
- Consider the end of life stage – stable/unstable, deteriorating and terminal, and plan care appropriate to the stage.
- The focus should be on managing symptoms, comfort and quality of life, including maintaining blood glucose in an acceptable range to prevent hypo- and hyperglycaemia.
- Use glucose lowering agents to manage corticosteroid-induced hyperglycaemia, if required.
- Document the person's end of life care wishes in an advanced care plan and other relevant proxy decision-making documents such as enduring power of attorney or 'not for resuscitation' plans. The documents must be appropriately signed and witnessed.
- The individual's religion and cultural traditions should be considered and documented, for example, care of the body after death.
- Refer to the palliative care team when indicated.
- Respect the individual's right to refuse treatment but offer compassionate, supportive care that controls distressing symptoms and promotes comfort.
- Consider family and carers' need for information, reassurance, and education.
- Initiate discussion about the role of life sustaining therapy.
- Implement supportive measures that keep the individual as free from pain and suffering as possible.
- For those with evidence of cognitive dysfunction, end of life planning should be undertaken while the individual can still make rational decisions.
- Develop and implement a communication strategy between the individual with dementia, family and carers, and healthcare team.

RATIONALE AND EVIDENCE BASE

Diabetes is increasingly recognized as an area where end of life care issues arise and that up to fairly recently, no guidelines were available. The aim of adopting a palliative approach and proactively documenting end of life care is to promote comfort, control distressing symptoms including pain, hypo- and hyperglycaemia, and preserve dignity. Treatment should be limited in the deteriorating and terminal stages when the hope of recovery is outweighed by the burden of treatment[319].

There is a need for clear proactive discussion about end of life care early, rather than during a crisis. However, healthcare professionals' discussion about end of life decisions and care are often presented in a negative way as a choice between medical treatment and withdrawing treatment. The individual may interpret this as the clinician giving up or a choice between life and death where people feel forced to make judgments about the value of a person's life, especially when the individual's wishes are not documented and the decision falls the family[320].

Evidence for optimal end of life care for people with diabetes is limited to a few studies, most of which are based on one paper and many did not involve diabetes specialists. Two recent sets of consensus guidelines[321,322] are available from:

www.diabetes.org.uk/upload/Position%20statements/End%20of%20Life%20Diabetes%20Care%20Stategy.pdf.

They were based on comprehensive literature reviews and followed appropriate guideline development processes. However, there is little evidence about end of life diabetes care generally.

Most experts agree the focus should be on managing symptoms, promoting comfort, and quality of life. People with diabetes also want to be comfortable free from pain and to die with dignity[323]. In addition, they want blood glucose controlled to avoid hypo- and hyperglycaemia and to continue blood glucose monitoring and glucose lowering agents until the terminal stage[321,323]. Programmes such as respecting patient choices also apply to end of life care and encourage people to document their decisions about treatment in the end stages of life.

Evidence suggests cultural and spiritual and religious beliefs and values and ethnicity also affect people's views and behaviours, including those of healthcare professionals. For example, non-white people are less likely to agree to 'not for resuscitation' (DNR) decisions and are more likely to request mechanical ventilation, artificial tube feeding, and cardiopulmonary pulmonary resuscitation, compared with whites[324]. Likewise, they are less likely to document advanced care plans. Some cultures regard withdrawing life support as killing the individual and might be equated with mercy killing, which can create difficulties for healthcare professionals and people with diabetes and their family/carers.

DNR is consistent with Islamic beliefs, which respect God's will and His decision about when people will die[324]. Asian people might regard decisions to withdraw active treatment and life support as unfamiliar because value is placed on the integrity of the family as a whole rather than the individual. Some religions regard suffering as a test of faith that can lead to redemption and welcome suffering and discomfort rather than trying to avoid it.

Other documents that provide general guidance about end of life care include The Palliative Care Guideline[325], which recommends shared decision-making and clarifying the care goals and individual's wishes and recognizes the healthcare professionals right to suggest recommendations based on clinical knowledge and experience.

IMPLEMENTATION IN ROUTINE CLINICAL PRACTICE

End of life diabetes care should become part of routine clinical practice and should always be considered early particularly when people are aged 80 years and over, residing in an aged care home, or have evidence of frailty or moderate dementia.

Advance planning decisions and documentation about end of life care should be is discussed when the older person with diabetes is capable of making care decisions and be part of goal setting and case review. Clinicians should plan to discuss end of life issues regularly because the person's wishes can change over time.

EVALUATION AND CLINICAL AUDIT INDICATORS

All older people with diabetes should be encouraged to develop an end of life care plan. The percentage of older people with diabetes with a document and communicated end of life care plan that is dated and regularly reviewed should be ascertained.

POTENTIAL INDICATOR

Indicator	Denominator	Calculation of indicator	Data to be collected for calculation of indicator
Percentage of people with type 2 diabetes living in an aged care home who have an end of life care plan documented	Total number of residents with type 2 diabetes	Number of residents with type 2 diabetes and an end of life care plan documented as a percentage of all residents with type 2 diabetes	Documented end of life care plan that is dated and reviewed

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ACRONYMS AND ABBREVIATIONS

ABI	ankle-brachial index
ACCORD	Action to Control CardiOvascular Risk in Diabetes
ACE-inhibitor	angiotensin converting enzyme-inhibitor
ACR	albumin:creatinine ratio
ADA-AGS	American Diabetes Association-American Geriatrics Society
ADA-EASD	American Diabetes Association-European Association for the Study of Diabetes
ADL	activities of daily living
ADVANCE	Action in Diabetes and Vascular disease: preterax And diamicroN-MR Controlled Evaluation
AIDS	acquired immunodeficiency syndrome
ARB	angiotensin-II receptor blocker
BMI	body mass index
CAN	cardiovascular autonomic neuropathy
CCB	calcium channel blocker
CGA	comprehensive geriatric assessment
CHSA	Community Health Status Assessment
CI	confidence interval
CKD	chronic kidney disease
CKD-EPI	Chronic Kidney Disease Epidemiology Collaboration
CVD	cardiovascular disease
DBP	diastolic blood pressure
DECODE	Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Europe
DECODA	Diabetes Epidemiology: Collaborative analysis Of Diagnostic criteria in Asia
DKA	diabetic ketoacidosis
DNR	do not resuscitate
DPP	Diabetes Prevention Program
DPP-4	dipeptidyl peptidase 4
ED	erectile dysfunction
EDWPOP-IAGG	European Diabetes Working Party for Older People-International Association of Gerontology and Geriatrics
eGFR	estimated glomerular filtration rate
EML	Essential Medicines List
FPG	fasting plasma glucose
GFR	glomerular filtration rate
GLP-1 RA	glucagon-like peptide-1 receptor antagonist
HbA_{1c}	glycated haemoglobin
HDL	high density lipoprotein
HHS	hyperosmolar hyperglycaemic state
HIV	human immunodeficiency virus infection
IADL	instrumental activities of daily living
ICU	intensive care unit
IDF	International Diabetes Federation
IDOP	Institute for Diabetes in Old People
IFG	impaired fasting glucose
IGT	impaired glucose tolerance

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INVEST	International VErapamil SR/Trandolapril Study
LDL	low density lipoprotein
MDRD	modification of diet in renal disease formula
MNA	Mini Nutritional Assessment
MNA-SF	Mini Nutritional Assessment-Short Form
M-RVBPI	Modified Residents' Verbal Brief Pain Inventory
MUST	Malnutrition Universal Screening Tool
OGTT	oral glucose tolerance test
PAD	peripheral arterial disease
PDE5	phosphodiesterase type-5
PEG	percutaneous endoscopic gastrostomy
PG-SGA	Patient-Generated Subjective Global Assessment
PHQ-9	9-item Patient Health Questionnaire
QUM	quality use of medicines
REACH	Reduction of Atherothrombosis of Continued Health
SAM	Suitability Assessment Method
SBP	systolic blood pressure
SCI-R	Self-Care Inventory Revised
SGA	Subjective Global Assessment
SGLT2	sodium glucose co-transporter 2
SMBG	self-monitoring of blood glucose
SNAQ	Simplified Nutritional Assessment Questionnaire
SU	sulfonylurea
TENS	transcutaneous electrical nerve stimulation
UK	United Kingdom
UKPDS	United Kingdom Prospective Diabetes Study
UN	United Nations
US	United States
VLDL	very-low-density lipoprotein
WHO	World Health Organization

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DISCLAIMER

IDF is not engaged in rendering medical services, advice, or recommendations to individuals with diabetes. The material provided in this publication is therefore intended and can be used for educational and informational purposes only. It is not intended as, nor can it be considered nor does it constitute, individual medical advice and it is thus not intended to be relied upon to diagnose, treat, cure, or prevent diabetes. People with diabetes should seek advice from and consult with professionally qualified medical and healthcare professionals on specific situations and conditions of concern. Reasonable endeavour has been used to ensure the accuracy of the information presented. However, the IDF assumes no legal liability or responsibility for the accuracy, currency, or completeness of the information provided herein. Any views, opinions, and/or recommendations contained in this publication are not those of IDF or endorsed by IDF, unless otherwise specifically indicated by the IDF. The IDF assumes no responsibility or liability for personal or other injury, loss, or damage that may result from the information contained within this publication.

23 REFERENCES

1. Sinclair AJ, Conroy SP, Bayer AJ. Impact of diabetes on physical function in older people. Diabetes Care 2008; 31: 233-5.
2. Krentz AJ, Viljoen A, Sinclair A. Insulin resistance: a risk marker for disease and disability in the older person. Diabet Med 2013; 30: 535-48.
3. Morley JE. The elderly type 2 diabetic patient: special considerations. Diabet Med 1998; 15: S41-6.
4. Sinclair AJ, Paolisso G, Castro M, et al. European Diabetes Working Party for Older People 2011 clinical guidelines for type 2 diabetes mellitus. Executive summary. Diabetes Metab 2011; 37: S27-38.
5. Kirkman MS, Briscoe VJ, Clark N, et al. Diabetes in older adults: a consensus report. J Am Geriatr Soc 2012; 60: 2342-56.
6. Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes: a patient-centered approach: position statement of the American Diabetes Association (ADA) and the European Association for the Study of Diabetes (EASD). Diabetes Care 2012; 35: 1364-79.
7. Kirkman MS, Briscoe VJ, Clark N, et al. Diabetes in older adults. Diabetes Care 2012; 35: 2650-64.
8. International Diabetes Federation. Global guideline for type 2 diabetes. Brussels: International Diabetes Federation; 2012.
9. Fried LP, Tangen CM, Walston J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Bio Sci Med Sci 2001; 56: M146-56.
10. Sinclair A, Morley J. Frailty and diabetes. Lancet 2013; 382: 1386-7.
11. Hubbard RE, Andrew MK, Fallah N, et al. Comparison of the prognostic importance of diagnosed diabetes, co-morbidity and frailty in older people. Diabet Med 2010; 27: 603-6.
12. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J 1965; 14: 61-5.
13. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969; 9: 179-86.
14. Sinclair AJ, Gadsby R, Hillson R, et al. Brief report: use of the Mini-Cog as a screening tool for cognitive impairment in diabetes in primary care. Diabetes Res Clin Pract 2013; 100: e23-5.
15. Smith T, Gildeh N, Holmes C. The Montreal Cognitive Assessment: validity and utility in a memory clinic setting. Can J Psychiatry 2007; 52: 329-32.
16. Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. Clin Gerontol 1986; 5: 165-73.
17. Moorhouse P, Rockwood K. Frailty and its quantitative clinical evaluation. J Royal Coll Phys Edinb 2012; 42: 333-40.
18. Khagram L, Martin CR, Davies MJ, et al. Psychometric validation of the Self-Care Inventory-Revised (SCI-R) in UK adults with type 2 diabetes using data from the AT.LANTUS Follow-on study. Health Qual Life Outcomes 2013; 11: 24.
19. Stratton RJ, Hackston A, Longmore D, et al. Malnutrition in hospital outpatients and inpatients: prevalence, concurrent validity and ease of use of the 'malnutrition universal screening tool' ('MUST') for adults. Br J Nutr 2004; 92: 799-808.
20. Kaiser MJ, Bauer JM, Ramsch C, et al. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. J Nutr Health Aging 2009; 13: 782-8.
21. Institute of Diabetes for Older People. Three steps assessment package; 2011. Available from: http://www.instituteofdiabetes.org.
22. Australian Pain Society. The Australian Pain Society; 2005. Available from: http://www.apsoc.org.au.
23. Herr KA, Spratt K, Mobily PR, et al. Pain intensity assessment in older adults. Clin J Pain 2004; 20: 207-19.
24. Dunstan DW, Zimmet PZ, Welborn TA, et al. The rising prevalence of diabetes and impaired glucose tolerance: the Australian Diabetes, Obesity and Lifestyle Study. Diabetes Care 2002; 25: 829-34.
25. McBean AM, Li S, Gilbertson DT, et al. Differences in diabetes prevalence, incidence, and mortality among the elderly of four racial/ethnic groups: whites, blacks, hispanics, and asians. Diabetes Care 2004; 27: 2317-24.
26. DECODE Study Group. Age- and sex-specific prevalences of diabetes and impaired glucose regulation in 13 European cohorts. Diabetes Care 2003; 26: 61-9.
27. Qiao Q, Hu G, Tuomilehto J, et al. Age- and sex-specific prevalence of diabetes and impaired glucose regulation in 11 Asian cohorts. Diabetes Care 2003; 26: 1770-80.
28. Wallander M, Malmberg K, Norhammar A, et al. Oral glucose tolerance test: a reliable tool for early detection of glucose abnormalities in patients with acute myocardial infarction in clinical practice: a report on repeated oral glucose tolerance tests from the GAMI study. Diabetes Care 2008; 31: 36-8.
29. Vancheri F, Curcio M, Burgio A, et al. Impaired glucose metabolism in patients with acute stroke and no previous diagnosis of diabetes mellitus. QJM 2005; 8: 871-8.
30. Regenold WT, Thapar RK, Marano C, Gavirneni S, Kondapavuluru PV. Increased prevalence of type 2 diabetes mellitus among psychiatric inpatients with bipolar I affective and schizoaffective disorders independent of psychotropic drug use. J Affect Disord 2002; 70: 19-26.
31. Citrome LL, Holt RI, Zachry WM, et al. Risk of treatment-emergent diabetes mellitus in patients receiving antipsychotics. Ann Pharmacother 2007; 41: 1593-603.
32. Ramaswamy K, Masand PS, Nasrallah HA. Do certain atypical antipsychotics increase the risk of diabetes? A critical review of 17 pharmacoepidemiologic studies. Ann Clin Psychiatr 2006; 18: 183-94.
33. Bellantuono C, Tentoni L, Donda P. Antipsychotic drugs and risk of type 2 diabetes: An evidence-based approach. Hum Psychopharmacol 2004; 19: 549-58.
34. Szoke E, Shrayyef MZ, Messing S, et al. Effect of aging on glucose homeostasis: accelerated deterioration of beta-cell function in individuals with impaired glucose tolerance. Diabetes Care 2008;31:539-43.
35. Modan M, Halkin H, Karasik A, et al. Effectiveness of glycosylated hemoglobin, fasting plasma glucose, and a single post load plasma glucose level in population screening for glucose intolerance. Am J Epidemiol 1984; 119: 4431-44.
36. Cowie CC, Rust KF, Ford ES, et al. Full accounting of diabetes and pre-diabetes in the U.S. population in 1988-1994 and 2005-2006. Diabetes Care 2009; 32: 287-294.

37. Saydah S, Miret M, Sung J, et al. Postchallenge hyperglycemia and mortality in a national sample of U.S. adults. Diabetes Care 2001; 24: 1397-402.

38. DECODE study group, European Diabetes Epidemiology Group. Glucose tolerance and cardiovascular mortality. Comparison of fasting and 2-h diagnostic criteria. Arch Intern Med 2001; 161: 397-404.

39. Barrett-Connor E, Ferrara A. Isolated postchallenge hyperglycemia and the risk of fatal cardiovascular disease in older women and men. The Rancho Bernardo Study. Diabetes Care 1998; 21: 1236-9.

40. Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey, 1988-1994. Diabetes Care 1998; 21: 518-24.

41. Tuomilehto J, Lindström J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001; 344: 1343-50.

42. Knowler WC, Barrett-Connor E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med 2002; 346: 393-403.

43. Diabetes Prevention Program Research Group, Knowler WC, Fowler SE, et al. 10-year follow-up of diabetes incidence and weight loss in the Diabetes Prevention Program Outcomes Study. Lancet 2009; 374: 1677-86.

44. Brown JS, Wing R, Barrett-Connor E, et al. Lifestyle intervention is associated with lower prevalence of urinary incontinence: the Diabetes Prevention Program. Diabetes Care 2006; 29: 385-90.

45. Florez H, Pan Q, Ackermann RT, et al. Impact of lifestyle intervention and metformin on healthrelated quality of life: the Diabetes Prevention Program randomized trial. J Gen Intern Med 2012; 27: 1594-601.

46. Bernstein MA, Tucker KL, Ryan ND, et al. Higher dietary variety is associated with better nutritional status in frail elderly people. J Am Diet Assoc 2002; 102: 1096-104.

47. Devitt H. Exploring nutrition issues for older people with diabetes. Aus Diab Educat 2011; 14: 16-9.

48. Takata Y, Ansai T, Soh I, et al. Association between body mass index and mortality in an 80-year-old population. J Am Geriatr Soc 2007; 55: 913-7.

49. Szony G. Investigating weight loss in the elderly. Medicine Today 2004; 5: 53-7.

50. Kong MF, Horowitz M, Jones KL, et al. Natural history of diabetic gastroparesis. Diabetes Care 1999; 22: 503-7.

51. Braun L, Rosenfeldt F. Pharmaco-nutrient interactionc-a systematic review of zinc and antihypertemsive therapy. Int J Clin Pract 2012; 67: 717-25.

52. Government of South Australia. Healthy eating and diabetes: a guide for aged care facilities. Adelaide: Government of South Australia; 2012.

53. Villareal DT, Banks M, Siener C, et al. Physical frailty and body composition in obese elderly men and women. Obes Res 2004; 12: 913-20.

54. Villareal DT, Banks M, Sinacore DR, et al. Effect of weight loss and exercise on frailty on obese older adults. Arch Int Med 2006; 166: 860-6.

55. Shapses SA, Riedt CS. Bone, body weight, and weight reduction: what are the concerns? J Nutr 2006; 136: 1453-6.

56. Looijmans-van den Akker I, Verheij TJ, Buskens E, et al. Clinical effectiveness of first and repeat-influenza vaccination in adult and elderly diabetic patients. Diabetes Care 2006; 29: 1771-6.

57. Wang IK, Lin CL, Chang YC, et al. Effectiveness of influenza vaccination in elderly diabetic patients: a retrospective cohort study. Vaccine 2013; 31: 718-24.

58. Park SW, Goodpaster BH, Strotmeyer ES, et al. Decreased muscle strength and quality in older adults with type 2 diabetes The Health, Aging, and Body Composition Study. Diabetes 2006; 55: 1813-8.

59. Villareal DT, Chode S, Parimi N, et al. Weight loss, exercise,or both and physical function in obese older adults. N Engl J Med 2011; 364: 1218-29.

60. Bunman MP, Heckler EB, Haskell WL, et al. Objective light intensity physical activity associations with rated health in older adults. Am J Epidemiol 2010; 172: 1155-65.

61. Bruce D, Davis W, Cull C, et al. Diabetes education and knowledge in patients with type 2 diabetes from the community Freemantle Diabetes Study. J Diabetes Complicat 2003; 17: 82-9.

62. Home P, Mant J, Diaz J, et al. Management of type 2 diabetes: updated NICE guidelines. BMJ 2008; 336: 1306-8.

63. Greenhalgh T. Patient and public involvement in chronic illness: beyond the expert patient. BMJ 2009; 338: b49.

64. Diabetes UK. Year of Care; 2007. Available from: http://www.diabetes.org.uk/Guide-to-diabetes-OLD/Support_for_managing_your_diabetes/Year-of-care/.

65. Braun AK, Kubiak T, Kuntsche J, et al. SGS: a structured treatment and teaching programme for older patients with diabetes mellitus - a prospective randomised controlled multi-centre trial. Age Ageing 2009; 38: 390-6.

66. Dunning T. Nursing care of older people with diabetes. In: Dunning T, editor. Education and communicating with older people. Oxford: Blackwell Publishing; 2005.

67. Norris SL, Lau J, Smith SJ, et al. Self-management education for adults with type 2 diabetes: a meta-analysis of the effect on glycemic control. Diabetes Care 2002; 25: 1159-71.

68. Tshiananga JK, Kocher S, Weber C, et al. The effect of nurse-led diabetes self-management education on glycosylated hemoglobin and cardiovascular risk factors: a meta-analysis. Diabetes Educ 2012; 38: 108-23.

69. Malanda UL, Welschen LM, Riphagen II, et al. Self monitoring of blood glucose in patients with type 2 diabetes who are not using insulin. Cochrane DB Syst Rev 2012; 1: CD005060.

70. Suhl E, Bonsignore P. Diabetes self-management education for older adults: general principles and practical application. Diabetes Spectrum 2006; 19: 234-40.

71. McKenna K, Toooth L, King D, et al. Older patients request more information; a survey of use of written patient education materials in general practice. J Aging 2003; 22: 15-9.

72. Lu FP, Lin KP, Kuo HK. Diabetes and the risk of multi-system aging phenotypes: a systematic review and meta-analysis. PLoS ONE 2009; 4: e4144.

73. Huang ES, Gorawara-Bhat R, Chin MH. Self-reported goals of older patients with type 2 diabetes mellitus. J Am Geriatr Soc 2005; 53: 306-11.

74. Sinclair AJ, Robert IE, Croxson SC, et al. Mortality in older people with diabetes mellitus. Diabet Med 1997; 14: 639-47.

75. de Ruijter W, Westendorp RGJ, Assendelft WJJ. Use of Framingham risk score and new biomarkers to predict cardiovascular mortality in older people: population based observational cohort study. BMJ 2009; 338: a3083.

76. Doolan DM, Froelicher ES. Smoking cessation interventions in older adults. Prog Cardiovasc Nurs 2008; 23: 119-27.

77. Alexa ID, Constantinescu, Panaghiu L, et al. Cardiovascular risk in elderly patients. J Prev Med 2002; 10.

78. Bejan-Angoulvant T, Saadatian-Elahi M, Wright JM, et al. Treatment of hypertension in patients 80 years and older: the lower the better? A meta-analysis of randomized controlled trials. J Hypertens 2010; 28: 1366-72.

79. Beckett NS, Peters R, Fletcher AE, et al. Treatment of hypertension in patients 80 years of age or older. New Eng J Med 2008; 358: 1887-98.

80. Krumholtz HM, Seeman TE, Merrill SS, et al. Lack of association between cholesterol and coronary heart disease mortality and morbidity and all cause mortality in persons older than 70 years. JAMA 1994; 272: 1335-40.

81. Garg JP, Bakris GL. Microalbuminuria: marker of vascular dysfunction, risk factor for cardiovascular disease. Vasc Med 2002; 7: 35-43.

82. Klausen K, Borch-Johnsen K, Feldt-Rasmussen B, et al. Very low levels of microalbuminuria are associated with increased risk of coronary heart disease and death independently of renal function, hypertension, and diabetes. Circulation 2004; 110: 32-5.

83. Riddle MC, Ambrosius WT, Brillon DJ, et al. Epidemiologic relationships between A1C and all-cause mortality during a median 3.4-year follow-up of glycemic treatment in the ACCORD trial. Diabetes Care 2010; 33: 983-90.

84. ADVANCE Collaborative Group. Intensive blood glucose control and vascular outcomes in patients with type 2 diabetes. N Eng J Med 2008; 358: 2560-72.

85. Holman RR, Paul SK, Bethel MA, et al. 10-year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med 2008; 359: 1577-89.

86. Action to Control Cardiovascular Risk in Diabetes Study Group. Effects of intensive glucose lowering in type 2 diabetes. N Engl J Med 2008; 358: 2545-59.

87. Anderson RJ, Freedland KE, Clouse RE, et al. The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes Care 2001; 24: 1069.

88. Maraldi C, Volpato S, Penninx BW, et al. Diabetes mellitus, glycemic control, and incident depressive symptoms among 70- to 79-year-old persons: the health, aging, and body composition study. Arch Intern Med 2007; 167: 1137.

89. Gallo JJ, Bogner HR, Marales KH, et al. Depression, cardiovascular disease, diabetes and two-year mortality older primary-care patients. Am J Geriatr Psychiatry 2005; 13: 748-55.

90. Lustman PJ, Clouse RE. Treatment of depression in diabetes: impact on mood and medical outcome. J Psychosom Res 2002; 53: 917.

91. McDermott MM, Greenland P, Liu K, et al. The ankle brachial index is associated with leg function and physical activity: the Walking and Leg Circulation Study. Ann Intern Med 2002; 136: 873-83.

92. Mooe T, Franklin KA, Holmstrom K, et al. Sleep-disordered breathing and coronary artery disease: long-term prognosis. Am J Respir Crit Care Med 2001; 164: 1910-3.

93. International Diabetes Federation. Oral health for people with diabetes. Brussels: International Diabetes Federation; 2009.

94. Weiss A, Boaz M, Beloosesky Y, et al. Body mass index and risk of all-cause and cardiovascular mortality in hospitalized elderly patients with diabetes mellitus. Diabetic Med 2009; 26: 253-9.

95. Monami M, Lamanna C, Balzi D, et al. Metabolic syndrome and cardiovascular mortality in older type 2 diabetic patients: a longitudinal study. J Gerontol A Bio Sci Med Sci 2008; 63: 646-9.

96. Stevens LA, Schmid CH, Greene T, et al. Comparative performance of the CKD Epidemiology Collaboration (CKD-EPI) and the Modification of Diet in Renal Disease (MDRD) Study equations for estimating GFR levels above 60 mL/min/1.73 m^2. Am J Kidney Dis 2010; 56: 486-95.

97. Morley JE, Sinclair A. Individualising treatment for older people with diabetes. Lancet 2013; 382: 378-80.

98. Turnheim K. Drug therapy in the elderly. Exp Gerontol 2004; 39: 1731-8.

99. Neumiller JJ, Setter SM. Pharmacologic management of the older patient with type 2 diabetes mellitus. Am J Geriatr Pharmacother 2009; 7: 324-42.

100. Sinclair A, Morley JE, Rodriguez-Manas L, et al. Diabetes mellitus in older people: position statement on behalf of the International Association of Gerontology and Geriatrics (IAGG), the European Diabetes Working Party for Older People (EDWPOP), and the International Task Force of Experts in Diabetes. J Am Med Dir Assoc 2012; 13: 497-502.

101. IDF Clinical Guidelines Task Force. Global guideline for type 2 diabetes: recommendations for standard, comprehensive, and minimal care. Diabet Med 2006; 23: 579-93.

102. National Health and Medical Research Council. National evidence based guideline for blood glucose control in type 2 dibetes. Canberra: National Health and Medical Research Council; 2009.

103. Bennett WL, Maruthur NM, Singh S, et al. Comparative effectiveness and safety of medications for type 2 diabetes: an update including new drugs and 2-drug combinations. Ann Intern Med 2011; 154: 602-13.

104. Inzucchi SE. Clinical practice. Diagnosis of diabetes. N Engl J Med 2012; 367: 542-50.

105. Qaseem A, Humphrey LL, Sweet DE, et al. Oral pharmacologic treatment of type 2 diabetes mellitus: a clinical practice guideline from the American College of Physicians. Ann Intern Med 2012; 156: 218-31.

106. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Clinical practice guidelines for the prevention and management of diabetes in Canada. Can J Diabetes 2013; 37: S1-216.

107. Bruno G, De Micheli A, Frontoni S, et al. Highlights from "Italian Standards of care for Diabetes Mellitus 2009-2010". Nutr Metab Cardiovasc Dis 2011; 21: 302-14.

108. Boussageon R, Supper I, Bejan-Angoulvant T, et al. Reappraisal of metformin efficacy in the treatment of type 2 diabetes: a meta-analysis of randomised controlled trials. PLoS Med 2012; 9: e1001204.

109. Roussel R, Travert F, Pasquet B, et al. Metformin use and mortality among patients with diabetes and atherothrombosis. Arch Intern Med 2010; 170: 1892-9.

110. Lee CG, Boyko EJ, Barrett-Connor E, et al. Insulin sensitizers may attenuate lean mass loss in older men with diabetes. Diabetes Care 2011; 34: 2381-6.

111. Lipska KJ, Bailey CJ, Inzucchi SE. Use of metformin in the setting of mild-to-moderate renal insufficiency. Diabetes Care 2011; 34: 1431-7.

112. UK Prospective Diabetes Study Group. Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). Lancet 1998; 352: 837-53.

113. van Staa T, Abenhaim L, Monette J. Rates of hypoglycemia in users of sulfonylureas. J Clin Epidemiol 1997; 50: 735-41.

114. American Geriatrics Society. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc 2012; 60: 616-31. Available from: http://www.americangeriatrics.org/files/documents/beers/2012BeersCriteria_JAGS.pdf.

115. Chanal H. Should elderly patients with type 2 diabetes be treated with glibenclamide (glyburide) or different sulphonylurea? Geneva: World Health Organization; 2013.

116. Haas L. Management of diabetes mellitus medications in the nursing home. Drugs Aging 2005; 22: 209-18.

117. Pratley RE, Rosenstock J, Pi-Sunyer FX, et al. Management of type 2 diabetes in treatment-naive elderly patients: benefits and risks of vildagliptin monotherapy. Diabetes Care 2007; 30: 3017-22.

118. Karyekar CS, Ravichandran S, Allen E, et al. Tolerability and efficacy of glycemic control with saxagliptin in older patients (aged >/= 65 years) with inadequately controlled type 2 diabetes mellitus. Clin Interv Aging 2013; 8: 419-30.

119. Amori RE, Lau J, Pittas AG. Efficacy and safety of incretin therapy in type 2 diabetes: systematic review and meta-analysis. JAMA 2007; 298: 194-206.

120. White WB, Bakris GL, Bergenstal RM, et al. EXamination of cArdiovascular outcoMes with alogliptIN versus standard of carE in patients with type 2 diabetes mellitus and acute coronary syndrome (EXAMINE): a cardiovascular safety study of the dipeptidyl peptidase 4 inhibitor alogliptin in patients with type 2 diabetes with acute coronary syndrome. Am Heart J 2011; 162: 620-6.

121. Scirica BM, Bhatt DL, Braunwald E, et al. Saxagliptin and cardiovascular outcomes in patients with type 2 diabetes mellitus. N Eng J Med 2013; 369: 1317-26.

122. van de Laar FA, Lucassen PL, Akkermans RP, et al. Alpha-glucosidase inhibitors for patients with type 2 diabetes: results from a Cochrane systematic review and meta-analysis. Diabetes Care 2005; 28: 154-63.

123. Hanefeld M, Cagatay M, Petrowitsch T, et al. Acarbose reduces the risk for myocardial infarction in type 2 diabetic patients: meta-analysis of seven long-term studies. Eur Heart J 2004; 25: 10-6.

124. Yki-Jarvinen H. Thiazolidinediones. N Engl J Med 2004; 351: 1106-18.

125. Meier C, Kraenzlin ME, Bodmer M, et al. Use of thiazolidinediones and fracture risk. Arch Intern Med 2008; 168: 820-5.

126. Bode BW, Brett J, Falahati A, et al. Comparison of the efficacy and tolerability profile of liraglutide, a once-daily human GLP-1 analog, in patients with type 2 diabetes >/=65 and <65 years of age: a pooled analysis from phase III studies. Am J Geriatr Pharmacother 2011; 9: 423-33.

127. Nauck MA, Meier JJ. Individualised incretin-based treatment for type 2 diabetes. Lancet 2010; 376: 393-4.

128. Munshi MN, Pandya N, Umpierrez GE, et al. Contributions of basal and prandial hyperglycemia to total hyperglycemia in older and younger adults with type 2 diabetes mellitus. J Am Geriatr Soc 2013; 61: 535-41.

129. Siebenhofer A, Plank J, Berghold A, et al. Short acting insulin analogues versus regular human insulin in patients with diabetes mellitus. Cochrane Database Syst Rev 2006; 2: CD003287.

130. Horvath K, Jeitler K, Berghold A, et al. Long-acting insulin analogues versus NPH insulin (human isophane insulin) for type 2 diabetes mellitus. Cochrane Database Syst Rev 2007; 2: CD005613.

131. Karnieli E, Baeres FM, Dzida G, et al. Observational study of once-daily insulin detemir in people with type 2 diabetes aged 75 years or older: a sub-analysis of data from the Study of Once daily LeVEmir (SOLVE). Drugs Aging 2013; 30: 167-75.

132. Pandya N, Digenio A, Gao L, et al. Efficacy and safety of insulin glargine compared to other interventions in younger and older adults: a pooled analysis of nine open-label, randomized controlled trials in patients with type 2 diabetes. Drugs Aging 2013; 30: 429-38.

133. Chobanian AV, Bakris GL, Black HR, et al. The seventh seport of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. JAMA 2003; 289: 2560-72.

134. Sacks FM, Svetkey LP, Vollmer WM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. N Engl J Med 2001; 344: 3-10.

135. Arauz-Pacheco C, Parrott MA, Raskin P. Hypertension management in adults with diabetes. Diabetes Care 2004; 27: S65-7.

136. Sowers JR, Epstein M. Diabetes mellitus and associated hypertension, vascular disease, and nephropathy. An update. Hypertension 1995; 26: 869-79.

137. Schall P, Wehling M. Treatment of arterial hypertension in the very elderly: a meta-analysis of clinical trials. Arzneimittelforschung 2011; 61: 221-8.

138. American Diabetes Association. Standards of medical care for patients with diabetes mellitus - 2013. Diabetes Care 2013; 36: S11-66.

139. Mancia G, Laurent S, Agabiti-Rosei E, et al. Reappraisal of European guidelines on hypertension management: a European Society of Hypertension Task Force document. J Hypertens 2009; 27: 2121-58.

140. Cushman WC, Evans GW, Byington RP, et al. Effects of intensive blood-pressure control in type 2 diabetes mellitus. N Engl J Med 2010; 362: 1575-85.

141. Beckett NS, Peters R, Fletcher AE, et al. Treatment of hypertension in patients 80 years of age or older. N Engl J Med 2008; 358: 1887-98.

142. Bulpitt CJ, Beckett NS, Cooke J, et al. Results of the pilot study for the Hypertension in the Very Elderly Trial. J Hypertens 2003; 21: 2409-17.

143. Beckett N, Peters R, Tuomilehto J, et al. Immediate and late benefits of treating very elderly people with hypertension: results from active treatment extension to Hypertension in the Very Elderly randomised controlled trial. BMJ; 344: d7541.

144. Pepine CJ, Handberg EM, Cooper-DeHoff RM, et al. A calcium antagonist vs a non-calcium antagonist hypertension treatment strategy for patients with coronary artery disease. The International Verapamil-Trandolapril Study (INVEST): a randomized controlled trial. JAMA 2003; 290: 2805-16.

145. Bray GA, Vollmer WM, Sacks FM, et al. A further subgroup analysis of the effects of the DASH diet and three dietary sodium levels on blood pressure: results of the DASH-Sodium Trial. Am J Cardiol 2004; 94: 222-7.

146. KDOQI. KDOQI clinical practice guidelines and clinical practice recommendations for diabetes and chronic kidney disease. Am J Kidney Dis 2007; 49: S12-154.

147. Bakris GL, Williams M, Dworkin L, et al. Preserving renal function in adults with hypertension and diabetes: a consensus approach. National Kidney Foundation Hypertension and Diabetes Executive Committees Working Group. Am J Kidney Dis 2000; 36: 646-61.

148. Efficacy of atenolol and captopril in reducing risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 39. UK Prospective Diabetes Study Group. BMJ 1998; 317: 713-20.

149. ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial. Major outcomes in high-risk hypertensive patients randomized to angiotensin-converting enzyme inhibitor or calcium channel blocker vs diuretic: The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT). JAMA 2002; 288: 2981-97.

150. Lindholm LH, Hansson L, Ekbom T, et al. Comparison of antihypertensive treatments in preventing cardiovascular events in elderly diabetic patients: results from the Swedish Trial in Old Patients with Hypertension-2. STOP Hypertension-2 Study Group. J Hypertens 2000; 18: 1671-5.

151. Estacio RO, Jeffers BW, Hiatt WR, et al. The effect of nisoldipine as compared with enalapril on cardiovascular outcomes in patients with non-insulin-dependent diabetes and hypertension. N Engl J Med 1998; 338: 645-52.

152. Corti MC, Guralnik JM, Salive ME, et al. Clarifying the direct relation between total cholesterol levels and death from coronary heart disease in older persons. Ann Intern Med 1997; 126: 753-60.

153. Cholesterol Treatment Trialists' Collaboration. Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170 000 participants in 26 randomised trials. Lancet 2010; 376: 1670-81.

154. Lewington S, Whitlock G, Clarke R, et al. Blood cholesterol and vascular mortality by age, sex, and blood pressure: a meta-analysis of individual data from 61 prospective studies with 55,000 vascular deaths. Lancet 2007; 370: 1829-39.

155. Aronow WS. Managing hyperlipidaemia in the elderly: special considerations for a population at high risk. Drugs Aging 2006; 23: 181-9.

156. Aronow WS. Managing hyperlipidaemia in the elderly: special considerations for a population at high risk. Drugs Aging 2006; 23: 181-9.

157. Eimer MJ, Stone NJ. Evidence-based treatment of lipids in the elderly. Curr Atheroscler Rep 2004; 6: 388-97.

158. Hayashi T, Kawashima S, Itoh H, et al. Low HDL cholesterol is associated with the risk of stroke in elderly diabetic individuals: changes in the risk for atherosclerotic diseases at various ages. Diabetes Care 2009; 32: 1221-3.

159. Hilmer S, Gnjidic D. Statins in older adults. Aust Prescr 2013; 36: 79-82.

160. Afilalo J, Duque G, Steele R, et al. Statins for secondary prevention in elderly patients: a hierarchical Bayesian meta-analysis. J Am Coll Cardiol 2008; 51: 37-45.

161. Baigent C, Keech A, Kearney PM, et al. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. Lancet 2005; 366: 1267-78.

162. McGuinness B, Craig D, Bullock R, et al. Statins for the prevention of dementia. Cochrane DB Syst Rev 2009; 2: CD003160.

163. Padala KP, Padala PR, McNeilly DP, et al. The effect of HMG-CoA reductase inhibitors on cognition in patients with Alzheimer's dementia: a prospective withdrawal and rechallenge pilot study. Am J Geriatr Pharmacother 2012; 10: 296-302.

164. Frick MH, Elo O, Haapa K, et al. Helsinki Heart Study: primary-prevention trial with gemfibrozil in middle-aged men with dyslipidemia. Safety of treatment, changes in risk factors, and incidence of coronary heart disease. N Engl J Med 1987; 317: 1237-45.

165. Holoshitz N, Alsheikh-Ali AA, Karas RH. Relative safety of gemfibrozil and fenofibrate in the absence of concomitant cerivastatin use. Am J Cardiol 2008; 101: 95-7.

166. Garg A, Grundy SM. Nicotinic acid as therapy for dyslipidemia in non-insulin-dependent diabetes mellitus. JAMA 1990; 264: 723-6.

167. Kei A, Elisaf MS. Nicotinic acid: clinical considerations. Expert Opin Drug Saf 2012; 11: 551-64.

168. Schectman G, Hiatt J, Hartz A. Evaluation of the effectiveness of lipid-lowering therapy (bile acid sequestrants, niacin, psyllium and lovastatin) for treating hypercholesterolemia in veterans. The American journal of cardiology 1993; 71: 759-65.

169. Cowie CC, Rust KF, Byrd-Holt DD, et al. Prevalence of diabetes and impaired fasting glucose in adults in the U.S. population: National Health And Nutrition Examination Survey 1999-2002. Diabetes Care 2006; 29: 1263-8.

170. Menzin J, Korn JR, Cohen J, et al. Relationship between glycemic control and diabetes-related hospital costs in patients with type 1 or type 2 diabetes mellitus. J Manag Care Pharm 2010; 16: 264-75.

171. Umpierrez GE, Smiley D, Jacobs S, et al. Randomized study of basal-bolus insulin therapy in the inpatient management of patients with type 2 diabetes undergoing general surgery (RABBIT 2 surgery). Diabetes Care 2011; 34: 256-61.

172. Ko C, Chaudhry S. The need for a multidisciplinary approach to cancer. J Sur Res 2002; 105: 53-7.

173. McCoubrie R, Jeffrey D, Paton C, et al. Managing diabetes mellitus in patients with advanced cancer: a case note audit and guidelines. Eur J Cancer Care 2005; 1: 244-8.

174. Maynard G, O'Malley CW, Kirsh SR. Perioperative care of the geriatric patient with diabetes or hyperglycemia. Clin Geriatr Med 2008; 24: 649-65.

175. Vischer UM, Giannelli SV, Weiss L, et al. The prevalence, characteristics and metabolic consequences of renal insufficiency in very old hospitalized diabetic patients. Diabetes Metab 2011; 37: 1318.

176. Afghahi H, Cederholm J, Eliasson B, et al. Risk factors for the development of albuminuria and renal impairment in type 2 diabetes-the Swedish National Diabetes Register (NDR). Nephrol Dial Transplant 2011; 26: 1236-43.

177. Schwenger V, Morath C, Hoffman A, et al. Late referral - a major cause of poor outcome in the very elderly dialysis patient. Nephrol Dial Transplant 2006; 21: 962-7.

178. Foley RN, Murray AM, Li S, et al. Chronic kidney disease and the risk for cardiovascular disease, renal replacement, and death in the United States Medicare population, 1998 to 1999. J Am Soc Nephrol 2005; 16: 489-95.

179. Strippoli GF, Bonifati C, Craig M, et al. Angiotensin converting enzyme inhibitors and angiotensin II receptor antagonists for preventing the progression of diabetic kidney disease. Cochrane DB Syst Rev 2006; 4: CD006257006.

180. Tu ST, Chang SJ, Chen JF, et al. Prevention of diabetic nephropathy by tight target control in an asian population with type 2 diabetes mellitus: a 4-year prospective analysis. Arch Intern Med 2010; 170: 155-61.

181. UK Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes (UKPDS 38). BMJ 1998; 317: 703-13.

182. Perkovic V, Heerspink HL, Chalmers J, et al. Intensive glucose control improves kidney outcomes in patients with type 2 diabetes. Kidney Int 2013; 83: 517-23.

183. Jones SA, Bhandari S. The prevalence of potentially inappropriate medication prescribing in elderly patients with chronic kidney disease. Postgrad Med J 2013; 89: 247-50.

184. Joosten H, Drion I, Boogerd KJ, et al. Optimising drug prescribing and dispensing in subjects at risk for drug errors due to renal impairment: improving drug safety in primary healthcare by low eGFR alerts. BMJ Open 2013; 3: e002068.

185. Erler A, Beyer M, Petersen JJ, et al. How to improve drug dosing for patients with renal impairment in primary care - a cluster-randomized controlled trial. BMC Farm Pract 2012; 13: 91.

186. Klein R, Klein BE, Moss SE, et al. The Wisconsin Epidemiologic Study of Diabetic Retinopathy IX. Four-year incidence and progression of diabetic retinopathy when age at diagnosis is less than 30 years. Arch Ophthalmol 1989; 107: 237-43.

187. Klein R, Klein BE, Moss SE, et al. The Wisconsin Epidemiologic Study of Diabetic Retinopathy X. Four-year incidence and progression of diabetic retinopathy when age at diagnosis is 30 years or more. Arch Ophthalmol 1989; 107: 244-9.

188. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. The Diabetes Control and Complications Trial Research Group. N Engl J Med 1993; 329: 977-86.

189. Chase HP, Garg SK, Jackson WE, et al. Blood pressure and retinopathy in type I diabetes. Ophthalmology 1990; 97: 155-9.

190. Matthews DR, Stratton IM, Aldington SJ, et al. Risks of progression of retinopathy and vision loss related to tight blood pressure control in type 2 diabetes mellitus: UKPDS 69. Arch Ophthalmol 2004; 122: 1631-40.

191. Chew EY, Klein ML, Ferris FL 3rd, et al. Association of elevated serum lipid levels with retinal hard exudate in diabetic retinopathy. Early Treatment Diabetic Retinopathy Study (ETDRS) Report 22. Arch Ophthalmol 1996; 114: 1079-84.

192. Cusick M, Chew EY, Chan CC, et al. Histopathology and regression of retinal hard exudates in diabetic retinopathy after reduction of elevated serum lipid levels. Ophthalmology 2003; 110: 2126-33.

193. Stratton IM, Kohner EM, Aldington SJ, et al. UKPDS 50: risk factors for incidence and progression of retinopathy in Type II diabetes over 6 years from diagnosis. Diabetologia 2001; 44: 156-63.

194. Birinci A, Birinci H, Abidinoglu R, et al. Diabetic retinopathy and HLA antigens in type 2 diabetes mellitus. Eur J Ophthalmol 2002; 12: 89-93.

195. Mimura T, Funatsu H, Uchigata Y, et al. Glutamic acid decarboxylase autoantibody prevalence and association with HLA genotype in patients with younger-onset type 1 diabetes and proliferative diabetic retinopathy. Ophthalmology 2005; 112: 1904-9.

196. Emanuele N, Sacks J, Klein R, et al. Ethnicity, race, and baseline retinopathy correlates in the veterans affairs diabetes trial. Diabetes Care 2005; 28: 1954-8.

197. Simmons D, Clover G, Hope C. Ethnic differences in diabetic retinopathy. Diabet Med 2007; 24: 1093-8.

198. Action to Control Cardiovascular Risk in Diabetes Study Group, Action to Control Cardiovascular Risk in Diabetes Eye Study Group. Effects of medical therapies on retinopathy progression in type 2 diabetes. N Eng J Med 2010; 363: 233-44.

199. Zoungas S, de Galen B, Ninomiya T, et al. Combined effects of routine blood pressure lowering and intensive glucose control on macrovascular and microvascular outcomes in patients with type 2 diabetes. New results from the ADVANCE trial. Diabetes Care 2009; 32: 2068-74.

200. Gæde P, Vedel P, Larsen N, et al. Multifactorial intervention and cardiovascular disease in patients with type 2 diabetes. N Eng J Med 2003; 348: 383-93.

201. Australian Diabetes Society for the Department of Health and Ageing. Guidelines for the management of diabetic retinopathy. Canberra: National Health and Medical Research Council; 2008.

202. Cohen S. Exclusions, suspensions and management of ungradables: NHS Diabetic Eye Screening Programme; 2012. Available from: http://www.diabeticeye.screening.nhs.uk/getdata.php?id=11652

203. Bakker K, Apelqvist J, Schaper NC. Practical guidelines on the management and prevention of the diabetic foot 2011. Diabetes Metab Res Rev 2012; 28: S225-31.

204. Lipsky BA, Berendt AR, Cornia PB, et al. Executive summary: 2012 Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clin Infect Dis 2012; 54: 1679-84.

205. Schaper NC, Andros G, Apelqvist J, et al. Diagnosis and treatment of peripheral arterial disease in diabetic patients with a foot ulcer. A progress report of the International Working Group on the Diabetic Foot. Diabetes Metab Res Rev 2012; 28: S218-24.

206. Escobar C, Blanes I, Ruiz A, et al. Prevalence and clinical profile and management of peripheral arterial disease in elderly patients with diabetes. Eur J Intern Med 2011; 22: 275-81.

207. La Manna G, Pancaldi LG, Capecchi A, et al. Risk for contrast nephropathy in patients undergoing coronarography. Artif Organs 2010; 34: e193-9.

208. Bachorzewska-Gajewska H, Malyszko J, Malyszko JS, et al. Undiagnosed renal impairment in patients with and without diabetes with normal serum creatinine undergoing percutaneous coronary intervention. Nephrology 2006; 11: 549-54.

209. Hinchliffe RJ, Andros G, Apelqvist J, et al. A systematic review of the effectiveness of revascularization of the ulcerated foot in patients with diabetes and peripheral arterial disease. Diabetes Metab Res Rev 2012; 28: 179-217.

210. Pataky Z, Vischer U. Diabetic foot disease in the elderly. Diabetes Metab 2007; 33 Suppl 1: S56-65.

211. de Leur K, van Zeeland ML, Ho GH, et al. Treatment for critical lower limb ischemia in elderly patients. World J Surg 2012; 36: 2937-43.

212. Carmona GA, Hoffmeyer P, Herrmann FR, et al. Major lower limb amputations in the elderly observed over ten years: the role of diabetes and peripheral arterial disease. Diabetes Metab 2005; 31: 449-54.

213. McCue JD. Antibiotic use in the elderly: issues and nonissues. Clin Infect Dis 1999; 28: 750-2.

214. Green P, Woglom AE, Genereux P, et al. The impact of frailty status on survival after transcatheter aortic valve replacement in older adults with severe aortic stenosis: a single-center experience. JACC Cardiovasc Interv 2012; 5: 974-81.

215. Lasithiotakis K, Petrakis J, Venianaki M, et al. Frailty predicts outcome of elective laparoscopic cholecystectomy in geriatric patients. Surg Endosc 2013; 27: 1144-50.

216. Neuman HB, Weiss JM, Leverson G, et al. Predictors of short-term postoperative survival after elective colectomy in colon cancer patients >/=80 years of age. Ann Surg Oncol 2013; 20: 1427-35.

217. Karpman RR, Del Mar NB. Supracondylar femoral fractures in the frail elderly. Fractures in need of treatment. Clin Orthop Relat Res 1995: 21-4.

218. Martini R, Andreozzi GM, Deri A, et al. Amputation rate and mortality in elderly patients with critical limb ischemia not suitable for revascularization. Aging Clin Exp Res 2012; 24: 24-7.

219. Edmonds ME, Blundell MP, Morris ME, et al. Improved survival of the diabetic foot: the role of a specialized foot clinic. QJM 1986; 60: 763-71.

220. Diabetes UK. End of life diabetes care clinical recommendations. London: Diabetes UK; 2012.

221. Malone JM, Snyder M, Anderson G, et al. Prevention of amputation by diabetic education. Am J Surg 1989; 158: 520-3.

222. Bril V, England J, Franklin GM, et al. Evidence-based guideline: treatment of painful diabetic neuropathy: report of the American Academy of Neurology, the American Association of Neuromuscular and Electrodiagnostic Medicine, and the American Academy of Physical Medicine and Rehabilitation. Neurology 2011; 76: 1758-65.

223. Amthor KF, Dahl-Jørgensen K, Berg TJ, et al. The effect of 8 years of strict glycaemic control on peripheral nerve function in IDDM patients: the Oslo Study. Diabetologia 1994; 37: 579.

224. Collins SL, Moore RA, McQuay HJ, et al. Antidepressants and anticonvulsants for diabetic neuropathy and postherpetic neuralgia: a quantitative systematic review. J Pain Symptom Manage 2000; 20: 449-58.

225. Dubinsky RM, Miyasaki J. Assessment: efficacy of transcutaneous electric nerve stimulation in the treatment of pain in neurologic disorders (an evidence-based review): report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology 2010; 74: 173.

226. Gatopoulou A, Papanas N, Maltezos E. Diabetic gastrointestinal autonomic neuropathy: current status and new achievements for everyday clinical practice. Eur J Intern Med 2012; 23: 499-505.

227. National Aging Research Institute. The wellness project: promoting older people's sexual health; 2002. Available from: http://www.mednwh.unimelb.edu.au/nari_research/pdf_docs/wellness_project.pdf.

228. Mona L, Syme M, Goldwasser G, et al. Sexual health in older adults; conceptualization and treatment. In: Sorocco K, Lauderdale S (eds). Cognitive behaviour therapy with older adults: innovations across care settings. New York: Springer; 2011.

229. Jannini EA, Fisher WA, Bitzer J, et al. Is sex just fun? How sexual activity improves health. J Sex Med 2009; 6: 2640-8.

230. Brody S. The relative health benefits of different sexual activities. J Sex Med 2010; 7: 1336-61.

231. Lindau S, Gavrilova N. Sex, health and years of sexual active life gained due to good health: evidence from two US population-based cross-sectional surveys of aging. BMJ 2010; 340: c810.

232. Syme M, Klonoff E, Macera C, et al. Predicting sexual decline and dissatisfaction among older adults: the role of partnered and individual physical and mental health factors. J Gerontol B Psychol Sci Soc Sci 2013; 68: 323-32.

233. Suzman R. The National Social Life, Health, and Aging Project: an introduction. J Gerontol A Bio Sci Med Sci 2009; 64b: i5-11.

234. Barlow J. Sexuality and elderly people: an overview of current knowledge. Sydney: Alpha Biomedical Communications; 1994.

235. Conaglen H, Conaglen J. Drug-indiced sexual dysfunction in men and women. Aust Prescr 2013; 36: 42-5.

236. Annon J. Behavioral treatment of sexual problems. University of Michigan: Harper & Row; 1976.

237. Bauer M, Fetherstonhaugh D, Tarzia L, et al. "I always look under the bed for a man". Needs and barriers to the expression of sexuality in residential aged care: the views of residents with and without dementia. Psychol Sex 2012; 4: 296-309.

238. McGill J, Shoskes P, Sabanegh E. Androgen deficiency in older men: indications, advantages, and pitfalls of testosterone replacement therapy. Cleve Clin J Med 2012; 79: 797-806.

239. Gott M, Hinchliff S. How important is sex in later life? The views of older people. Soc Sci Med 2003; 56: 1617-28.

240. Katz S, Marshall M. New sex for old: lifestyles, consumerism, and the ethics of aging. J Aging Stud 2003; 17: 3-16.

241. Gott M. Sexual health and the new aging. Age Aging 2006; 35: 106-7.

242. Emerging Risk Factors Collaboration, Sarwar N, Gao P, et al. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Lancet 2010; 375: 2215-22.

243. Capes SE, Hunt D, Malmberg K, et al. Stress hyperglycemia and prognosis of stroke in nondiabetic and diabetic patients: a systematic overview. Stroke 2001; 32: 2426-32.

244. Megherbi SE, Milan C, Minier D, et al. Association between diabetes and stroke subtype on survival and functional outcome 3 months after stroke: data from the European BIOMED Stroke Project. Stroke 2003; 34: 688-94.

245. Pendlebury ST, Rothwell PM. Prevalence, incidence, and factors associated with pre-stroke and post-stroke dementia: a systematic review and meta-analysis. Lancet Neurol 2009; 8: 1006-18.

246. Uyttenboogaart M, Koch MW, Stewart RE, et al. Moderate hyperglycaemia is associated with favourable outcome in acute lacunar stroke. Brain 2007; 130: 1626-30.

247. Fang Y ZS, Wu B, et al. Hyperglycaemia in acute lacunar stroke: a Chinese hospital-based study. Diab Vasc Dis Res. 2013; 10: 216-21.

248. Ahmed N, Dávalos A, Eriksson N, et al. Association of admission blood glucose and outcome in patients treated with intravenous thrombolysis: results from the Safe Implementation of Treatments in Stroke International Stroke Thrombolysis Register (SITS-ISTR). Arch Neurol 2010; 67: 1123-30.

249. Bellolio MF, Gilmore RM, Stead LG. Insulin for glycaemic control in acute ischaemic stroke. Cochrane Database Syst Rev 2011; 9: CD005346.

250. Oyibo SO, Sagi SV, Home C. Glycaemic control during enteral tube feeding in patients with diabetes who have had a stroke: a twice-daily insulin regimen. Practical Diabetes 2012; 29: 135-9.

251. Ali A, Bailey C, Abdelhafiz AH. Stroke prevention with oral anticoagulation in older people with atrial fibrillation - a pragmatic approach. Aging Dis 2012; 3: 339-51.

252. Carson AP, Muntner P, Kissela BM, et al. Association of prediabetes and diabetes with stroke symptoms. Diabetes Care 2012; 35: 1845-52.

253. Kessler R, Berglund P, Demler O, et al. The epidemiology of major depressive disorder. JAMA 2003; 289: 3095-105.

254. Gonzalez JS, Peyrot M, McCarl LA, et al. Depression and diabetes treatment non adherence: a meta-analysis. Diabetes Care 2008; 31: 2398-403.

255. Koopmans B, Pouwer F, de Bie RA, et al. Depressive symptoms are associated with physical inactivity in patients with type 2 diabetes. The DIAZOB Primary Care Diabetes study. Fam Pract 2009; 26: 171-3.

256. von Korff M, Katon W, Lin EH, et al. Potentially modifiable factors associated with disability among people with diabetes. Psychosom Med 2005; 67: 233-40.

257. Schram MT, Baan CA, Pouwer F. Depression and quality of life in patients with diabetes: a systematic review from the European depression in diabetes (EDID) research consortium. Curr Diabetes Rev 2009; 5: 112-9.

258. van Dooren FEP, Nefs G, Schram MT, et al. Depression and risk of mortality in people with diabetes mellitus: a systematic review and meta-analysis. PLoS ONE 2013; 8: e57058.

259. van der Feltz-Cornelis CM, Nuyen J, Stoop C, et al. Effect of interventions for major depressive disorder and significant depressive symptoms in patients with diabetes mellitus: a systematic review and meta-analysis. Gen Hosp Psychiatry 2010; 32: 380-95.

260. Strawbridge WJ, Deleger S, Roberts RE, et al. Physical activity reduces the risk of subsequent depression in older adults. Am J Epidemiol 2002; 156: 328-34.

261. Wild D, von Maltzahn R, Brohan E, et al. A critical review of the literature on fear of hypoglycemia in diabetes: Implications for diabetes management and patient education. Patient Educ Couns 2007; 68: 10-5.

262. Bogner HR, Morales KH, de Vries HF, et al. Integrated management of type 2 diabetes mellitus and depression: treatment to improve medication adherence: a randomized controlled trial. Ann Fam Med 2012; 10: 15-22.

263. National Institute for Health and Care Excellence. Depression: the treatment and management of depression in adults. London: National Institute for Health and Care Excellence; 2009.

264. Kroenke K, Spitzer R, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001; 16: 606-13.

265. Hoyl MT, Alessi CA, Harker JO, et al. Development and testing of a five item version of the Geriatric Depression Scale. J Am Geriatr Soc 1999; 47: 873-8.

266. Cryer P. Management of hypoglycaemia during treatment of diabetes mellitus; 2013. Available from: http://www.uptodate.com/contents/managment-of-hypoglycaemia-during-treatment-of-hypoglycaemia.

267. Matyka K, Evans M, Lomas J, et al. Altered hierarchy of protective responses to severe hypoglycaemia in normal aging in healthy men. Diabetes Care 1997; 20: 135-41.

268. Bremer JP, Jauch-Chara K, Hallschmid M, et al. Hypoglycaemia unawareness in older compared to middle aged patients with type 2 diabetes. Diabetes Care 2009; 32: 1513-7.

269. Sommerfield A, Deary IJ, McAuly V, Frier B. Short term delayed and working memory are impaired during hypoglycaemia in individuals with type 1 diabetes. Diabetes Care 2003; 26: 390-6.

270. Seaquist E, Anderson J, Childs B, et al. Hypoglycaemia and diabetes: a report of a workgroup of the American Diabetes Association and The Endocrine Society Diabetes Care 2013; 36: 1384-95.

271. Kagansky N, Levy S, Rimon E, et al. Hypoglycaemia as a predictor of mortality in hospitalised elderly patients. Arch Intern Med 2003; 163: 1825-9.

272. Hsu PF, Sung SH, Cheng HM, et al. Association of clinical symptomatic hypoglycaemia with cardiovascular events with cardiovascular events and total mortality in type 2 diabetes mellitus. Diabetes Care 2012; 36: 894-900.

273. Shorr RI, Ray WA, Daugherty JR, et al. Incidence and risk factors for serious hypoglycaemia in older persons using insulin or sulphonylurea. Arch Int Med 1997; 157: 1681-6.

274. Barendse S, Singh H, Frier B, et al. The impact of hypoglycaemia on quality of life and related reported outcomes in type 2 diabetes: a narrative review. Diabetic Medicine 2012; 29: 293-303.

275. Pogach L, Aron D. The other side of quality improvement in diabetes for seniors: a proposal for an overtreatment glycemic measure. Arch Intern Med 2012; 172: 1510-2.

276. Savage MW, Kilvert A. ABCD guidelines for the management of hyperglycaemic emergencies in adults. Pract Diabetes Int 2006; 23: 227-231.

277. Diabetes UK. The management of the hyperosmolar hyperglycaemic state (HSS) in adults with diabetes. London: Diabetes UK; 2012.

278. Volpato S, Leveille SG, Blaum C, et al. Risk factors for falls in older disabled women with diabetes: the women's health and aging study. J Gerontol A Biol Sci Med Sci 2005; 60: 1539-45.

279. Schwartz AV, Hillier TA, Sellmeyer DE, et al. Older women with diabetes have a higher risk of falls: a prospective study. Diabetes Care 2002; 25: 1749-54.

280. Quandt SA, Stafford JM, Bell RA, et al. Predictors of falls in a multiethnic population of older rural adults with diabetes. J Gerontol A Biol Sci Med Sci 2006; 61: 394-8.

281. Tilling LM, Darawil K, Britton M. Falls as a complication of diabetes mellitus in older people. J Diabetes Complications 2006; 20: 158-62.

282. Schwartz AV, Vittinghoff E, Sellmeyer DE, et al. Diabetes-related complications, glycemic control, and falls in older adults. Diabetes Care 2008; 31: 391-6.

283. Huang ES, Karter AJ, Danielson KK, et al. The association between the number of prescription medications and incident falls in a multi-ethnic population of adult type-2 diabetes patients: the diabetes and aging study. J Gen Intern Med 2010; 25: 141-6.

284. Nelson JM, Dufraux K, Cook PF. The relationship between glycemic control and falls in older adults. J Am Geriatr Soc 2007; 55: 2041-4.

285. Puar TH, Khoo JJ, Cho LW, et al. Association between glycemic control and hip fracture. J Am Geriatr Soc 2012; 60: 1493-7.

286. Macgilchrist C, Paul L, Ellis BM, et al. Lower-limb risk factors for falls in people with diabetes mellitus. Diabet Med 2010; 27: 162-8.

287. Allet L, Armand S, Aminian K, et al. An exercise intervention to improve diabetic patients' gait in a real-life environment. Gait Posture 2010; 32: 185-90.

288. Allet L, Armand S, de Bie RA, et al. The gait and balance of patients with diabetes can be improved: a randomised controlled trial. Diabetologia 2010; 53: 458-66.

289. Morrison S, Colberg SR, Mariano M, et al. Balance training reduces falls risk in older individuals with type 2 diabetes. Diabetes Care 2010; 33: 748-50.

290. Salsabili H, Bahrpeyma F, Forogh B, et al. Dynamic stability training improves standing balance control in neuropathic patients with type 2 diabetes. J Rehabil Res Dev 2011; 48: 775-86.

291. American Medical Directors Association. Pain management in the long term care setting. Columbia: American Medical Directors Association; 2012.

292. American Geriatrics Society Panel on Persistent Pain in Older Persons. The management of persistent pain in older persons. J Am Geriatr Soc 2002; 50: S205-24.

293. Royal College of Physicians, British Geriatrics Society, British Pain Society. The assessment of pain in older people: national guidelines. London: Royal College of Physicians; 2007. Available from: http://www.rcplondon.ac.uk/pubs/contemts/497d5548-ee0e-45ca-aa4b-4eaddf9724cb.pdf.

294. Helme R, Katz B. Pain management in elderly people: an overview of current knowledge. Sydney: Alpha Biomedical Communications; 1994.

295. Access Economics. The high price of pain: the economic impact of persistent pain in Australia. Sydney: Access Economics; 2007.

296. Torrance N, Elliott AM, Lee AJ, et al. Severe chronic pain is associated with increased 10 year mortality: a cohort record linkage study. Eur J Pain 2010; 14: 380-6.

297. Malik R, Baker N, Bartlett, et al. Addressing the burden of DPNP: improving detection in primary care. Diabetic Foot J 2010; 13: 2-7.

298. Davies M, Brophy S, Williams R, et al. The prevalence, severity, and impact of painful diabetic peripheral neuropathy in type 2 diabetes. Diabetes Care 2006; 29: 1518-22.

299. Lapane K, Quilliam B, Chow W, et al. Pain management in nursing home residents: is it adequate? J Pain Symptom Manage 2013; 45: 33-42.

300. Baliki MN, Schnitzer TJ, Bauer WR, et al. Brain morphological signatures for chronic pain. PLoS One 2011; 6: e26010.

301. International Pain Summit Of The International Association For The Study Of Pain. Declaration of Montréal: declaration that access to pain management is a fundamental human right. J Pain Palliat Care Pharmacother 2011; 25: 29-31.

302. Herr K. Pain assessment in older adults with verbal communication skills. In: Pain in older persons Gibson S, Weiner D (eds). Seattle: ISAP Press; 2005.

303. Banicek J. How to ensure acute pain in older people is appropriately assessed and managed. Nurs Times 2010; 106: 14-7.

304. Hanks-Bell M, Halvey K, Paice JA. Pain assessment and management in aging. Online J Issues Nurs 2004; 9: 8.

305. Husebo B, Ballard C, Sandvik R, et al. Efficacy of treating pain to reduce behavioural disturbances in residents of nursing homes with dementia: cluster randomised clinical trial. BMJ 2011; 343: d4065.

306. Abdulla A, Bone M, Adams N, et al. Evidence-based clinical practice guidelines on management of pain in older people. Age Ageing 2013; 42: 151-3.

307. Sorensen L. Painful diabetic neuropathy - new approaches. Diabetes Manage J 2011; 35: 4-5.

308. Possner AB. Feeling your patient's pain. Medscape 2011.

309. Sinclair AJ, Aspray TJ. Diabetes in care homes. In: Sinclair AJ (ed). Diabetes in old age. Chichester: John Wiley & Sons; 2009.

310. Hauner H, Kurnaz AA, Haastert B, et al. Undiagnosed diabetes mellitus and metabolic control, assessed by HbA (1c) among residents of nursing homes. Exp Clin Endocrinol Diabetes 2001; 109: 326-9.

311. Gill EA, Corwin PA, Mangin DA, et al. Diabetes care in rest homes in Christchurch, New Zealand. Diabetic Med 2006; 23: 1252-6.

312. Aspray TJ, Nesbit K, Cassidy TP, et al. Diabetes in British nursing and residential homes: a pragmatic screening study. Diabetes Care 2006; 29: 707-8.

313. Sinclair AJ, Allard I, Bayer AJ. Observations of diabetes care in long-term institutional settings with measures of cognitive function and dependency. Diabetes Care 1997; 20: 778-84.

314. van Dijk PT, Mehr DR, Ooms ME, et al. Comorbidity and 1-year mortality risks in nursing home residents. JAGS 2005; 53: 660-5.

315. Gadsby R, Galloway M, Barker P, et al. Prescribed medicines for elderly frail people with diabetes resident in nursing homes-issues of polypharmacy and medication costs. Diabet Med 2012; 29: 136-9.

316. Sinclair A, Girling A, Gadsby R, et al. Diabetes in care homes: a cluster randomized controlled trial of resident education. Br J Diabetes Vasc Dis 2012; 12: 238-42.

317. Sinclair AJ, Task and Finish Group of Diabetes UK. Good clinical practice guidelines for care home residents with diabetes: an executive summary. Diabet Med 2011; 28: 772-7.

318. Dunning T, Savage S, Duggan N. The McKellar guidelines for managing diabetes in residential aged care centres. Geelong: Barwon Health Centre for Nursing and Allied Health Research; 2013.

319. Cohen S, Bewley J, Ridley S, et al. Guidelines for limitation of treatment for adults requiring intensive care. Riyadh: King Saud University; 2003. Available from: http://www.ics.ac.uk/downloads/limitTreatGuidelines2003.pdf.

320. Eliott J, Olver I. Choosing between life and death; patient and family perceptions of the decision not to resuscuitate the terminally ill cancer patient. Bioethics 2008; 22: 179-89.

321. Dunning T, Savage S, Duggan N, et al. Guidelines for managing people with diabetes at the end of life. Geelong: Barwon Health Centre for Nursing and Allied Health Research; 2010. Available from: http://clearinghouse.adma.org.au/home/guideline/index.php.

322. Institute of Diabetes for Older People. End of life diabetes care. A strategy document commissioned by Diabetes UK; 2012. Available from: http://www.diabetes.org.uk/upload/Position%20statements/End%20of%20Life%20Diabetes%20Care%20Stategy.pdf.

323. Savage S, Dunning T, Duggan N, et al. The experiences and care preferences of people with diabetes at the end of life: a qualitative study. JHPN 2012; 14: 293-302.

324. Sarhill N, LeGrand S, Islambouli R, et al. The terminally ill Muslim: death and dying from the Muslim perspective. Am J Hosp Palliat Care 2001; 18: 251-5.

325. Institute for Clinical Systems Improvement. Palliative care guideline; 2012. Available from: http://wwwicsi.org/palliative_care_11918.html.

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