

Essential Steps in Primary Care Management of Older People with Type 2 Diabetes

***A Position Statement on behalf of the European Geriatric Medicine Society
(EuGMS) and the European Diabetes Working Party for Older People
(EDWPOP) Collaboration***

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Foreword and Rationale for this Collaborative Document between the EuGMS and EDWPOP

This collaborative *Guideline* on the primary care management of type 2 diabetes in older people is a timely but necessary development across Europe to enhance the quality of diabetes care for older people living independently and those who are in need of further support.

Whilst a number of recent publications of international clinical guidelines addressing the special needs of older people with diabetes are now available, the focus has been inpatient or clinic-based care thus creating the need for a primary care approach. This latter approach needs to review what glucose targets are appropriate, emphasise the importance of functional assessment and detection of frailty, how to avoid hypoglycaemia in community settings to reduce unnecessary hospital admissions, and how to employ lifestyle interventions to enhance intrinsic capacity and functional ability. This *Guideline* is the first detailed attempt to provide an evidence-based and good clinical practice approach to primary care diabetes care for older adult with diabetes.

The *Writing Group* for this *Guideline* acknowledges that geriatric diabetes as a condition has received little or no attention in the management plans of older people with diabetes from a primary care perspective. The *Writing Group* also recognises that there is a paucity of specific good quality studies on managing many of the key issues affecting older people with diabetes. This guideline is considered unique in that it attempts to provide evidenced-based recommendations for improving the care and health status of all older adults from a primary care viewpoint whilst at the same time recognising the often paucity of clinical trial data in this area. With this in mind, many of the low evidence strength recommendations should be viewed as best clinical practice only.

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EuGMS

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EDWPOP

The EDWPOP acknowledges the work of its members in completing this guidance and the additional support of Dr Ahmed Abdelhafiz in reviewing contributions.

Dedication

This collaborative document represents two years of interdisciplinary working across multiple European countries and emphasises the importance of patient empowerment and independence. Philip Ivory was an outstanding patient advocate who following his own diagnosis of type 2 diabetes dedicated the rest of his life to improving the care of all older people with this condition. We thank him for his important contribution to our work.

Duality of Interest Statement

None of the authors of this guidance declare any conflict of interest in its preparation and publication. No funding was received from any source in its development or publication.

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Scope of the Guideline

This Guideline aims to improve standards of diabetes care of older community-based adults who are predominantly managed by their primary care team. Where possible, published evidence has been used to develop these recommendations but in the absence of such evidence, expert opinion and consensus among the multidisciplinary *Writing Group* has also been sought. As with many similar guidelines, these recommendations can be audited nationally and revised based on the clinical experience gained by both health and social care professionals but also from the experience lived by patients and their carers.

Who should read these guidelines?

Every member of the community-based and primary care team who has direct care responsibility for older people with diabetes in their local area throughout the European community. This will also include dietitians, pharmacists, therapists, residential (non-nursing and nursing) care staff, community-based and primary care nurses as well as specialist diabetes nurses where available. This should also include those in health and social care who also provide care for this often vulnerable sector of the diabetes population.

Key Principles underpinning the Position Statement

The EuGMS-EDWPOP *Writing Group* has established a number of key principles which form a conceptual framework for this *Guideline*. These principles incorporate the important elements of managing older adults with diabetes particularly those within community and primary care settings.

These include:

- Ensure that all older adults with diabetes have an individualised care plan that includes functional status, a description of their complex illness and multimorbidity profiles, and life expectancy
- Where possible, all treatment decisions should be based on a comprehensive geriatric assessment model, favourable risk-benefit ratio, and with the full agreement of all those involved including the person with diabetes.
- A risk stratification approach is essential and include:
 - preventing hypoglycaemia
 - avoid unnecessary hospital admissions
 - detect frailty at an early stage
 - reduce worsening of ADL and IADL function, maintain mobility, and reduce falls

- minimise adverse events from treatment

- A clear focus on patient safety, avoiding further hospital and emergency department admissions and institutionalisation by recognising the deterioration early and maintaining independence and quality of life to a dignified death
- An emphasis to promote locally relevant interdisciplinary diabetes care teams in the community as part of a focused primary care initiative
- An encouragement to promote high quality clinical research and audit in the area of diabetes management in community and primary care settings.

Purpose, Format and Methodology of the *Guideline*

This *Guideline* has three **main purposes**:

(1) Identify a series of recommendations and Best Clinical Practice Statements in key areas that will support health and social care professionals in everyday local primary care settings to manage more effectively the complex issues seen in older adults with diabetes

(2) Arrive at a consensus among European specialists in diabetes and geriatric medicine on how we approach the management of important issues in managing older people with diabetes

(3) Provide a platform for commissioners of healthcare and policy makers in each nation across the European continent to plan a model care pathway that enhances diabetes care in older people in terms of quality and clinical outcomes.

Format: the content of this *Guideline* has been developed from teleconference discussion between *Writing Group* members from the EuGMS and EDWPOP European organisations, face to face meetings among some *Writing Group* members, and inputs from colleagues with multidisciplinary backgrounds. In particular, we have had significant primary care inputs and advice from person (patient) advocates.

The structure of this *Guideline* is based on the template of the International Diabetes Federation (IDF) Global Guideline on the Management of Type 2 Diabetes (2013)¹ and provides for each topic area an initial set of recommendations, followed by the rationale and evidence base that supports the recommendations, and key supporting references. All recommendations have also been compiled into a single table (Table 1 below).

Search Methodology: searches were limited to English language citations over the previous 15 years. The primary strategy attempted to locate any relevant systematic reviews or meta-analyses, or randomised controlled and controlled trials, but as discussed above, there were inherent limitations to this approach due to the lack of clinical trial or observation data.

The following databases were examined: Embase, Medline/PubMed, Cochrane Trials Register, CINAHL, and Science Citation. Hand searching of at least 12 major diabetes and ageing/geriatric medicine journals was also undertaken by the *Writing Group*. Last update December 2021

Grading Recommendations – A simplified approach that brings some objectivity to an area of low-strength evidence base

The Writing Group have adopted a relatively pragmatic view of assigning levels of evidence for this guideline. It is based on a template derived from the American Endocrine Society’s recent Clinical Practice Guideline: ²

1 – Terminology: recommendations are graded in terms of the strength. For stronger recommendations (3A/4A) we have used the phrase “we recommend” and for weak recommendations (1A/2A), we have used the phrase “we suggest” as appropriate.

2 – Strength/quality

The following simplified approach was used:

4A -**Higher strength** – evidence from meta-analyses/systematic reviews of RCTs, RCTs with low risk of bias

3A – **Moderate strength** – evidence from RCTs with a high risk of bias, systematic reviews of well conducted cohort or case control studies

2A – **Lower strength** – evidence from well conducted cohort or case-control studies with a low risk of bias

1A – **Expert Opinion** (no direct evidence available) – to be used as ‘Good Clinical Practice Statements’ where indicated

In each appropriate chapter of this guideline, we have listed key references that support a recommendation at the 3A-4A Level, with suggested recommendations at the 1A-2A levels.

References

1. International Diabetes Federation. 2014. Global guideline for the management of type 2 diabetes in older people. Available at: [Guidelines \(idf.org\)](http://www.idf.org). Last accessed 01.02.2022

2. LeRoith D, Biessels GJ, Braithwaite SS, Casanueva FF, Draznin B, Halter JB, Hirsch IB, McDonnell ME, Molitch ME, Murad MH, Sinclair AJ. Treatment of Diabetes in Older Adults: An Endocrine Society Clinical Practice Guideline. *Clin Endocrinol Metab.* 2019 May 1;104(5):1520-1574.

Table 1. Summary of recommendations that Enhance the Practice and Quality of Primary Care Management of Diabetes

Recommendations that Enhance the Practice and Quality of Primary Care Management of Diabetes	
Aims of care	<p>1 We suggest that the aims of care should be aligned with the health and social needs of the person with diabetes and be based on an evaluation of functional status and comorbidity profile including a comprehensive geriatric assessment using a precision medicine approach. (1A)</p> <p>2 We suggest that a patient-centered and individualized care plan needs to be updated at regular intervals and its importance clearly explained to the patient. (1A)</p> <p>3 The prevailing level of glycaemia of an older person with diabetes is of utmost importance. We recommend a HbA1c target of 53-58 mmol/mol in someone without frailty or dementia and without significant associated medical comorbidities. (3A)</p>
Monitoring	<p>1 Self-monitoring of blood glucose (SMBG) should only be routinely recommended in older people with type 1 diabetes (3A)</p> <p>2 We suggest that SMBG should be considered in the following groups:</p> <ul style="list-style-type: none"> a. Older people with type 2 diabetes on insulin therapy. (2A) b. Older people with diabetes on oral hypoglycaemic therapy that have high hypoglycaemic risk potential. (2A) c. Older patients with diabetes on any hypoglycaemic therapy but having frequent episodes of hypoglycaemia. (2A) d. Older people with diabetes during acute illness or poor glycaemic control that needs significant adjustment of hypoglycaemic therapy (2A). <p>3 We suggest that continuous glucose monitoring (CGM) should be considered in patients with significant glycaemic variability. (2A)</p> <p>4 We suggest that assessment of physical and cognitive functions along with education are required before planning glucose monitoring. (1A)</p>
Screening and Diagnosis	<p>1 A diagnosis of T2DM is based on at least 2 fasting blood glucose measures $\geq 7\text{mmol/l}$ or any-time blood glucose $\geq 11\text{mmol/l}$. An HbA1c value $\geq 48\text{mmol/mol}$ (6.5%) may also be used to diagnose T2DM but fasting glycaemia should always be determined. (World Health Organization, WHO) (4A)</p> <p>2 At diagnosis, a patient metabolic profile must be assessed: BMI and search for recent weight loss, HbA1c, lipid profile, and estimate of muscle mass such as mid-calf or mid-arm circumference if DEXA or CT scans are not available. (4A)</p> <p>3 In the presence of rapidly increasing symptomatic glycaemia, an autoimmune form of DM (Latent Autoimmune Diabetes in the Adult, LADA) should be suspected and confirmed with measure of anti-insulin antibodies. (3A)</p>

	<p>4 Screening for diabetes must be considered in the following circumstances: delirium and/or vascular dementia, repeated infections specially mycosis, high dose treatment with corticosteroids, presence of macrovascular conditions (coronary, cerebrovascular, peripheral) or significant microvascular conditions (retinopathy, neuropathy, nephropathy), autonomic abnormalities, prolonged treatment with atypical antipsychotics, progressive weight loss and frailty. (4A)</p> <p>5 In older subjects without symptoms and with potential benefits from early detection of diabetes, we suggest that screening should be proposed at regular intervals such as every three years. (1A)</p>
<p>Lifestyle and Prevention of Diabetes including Immunisation</p>	<p>1 We recommend achieving ideal body weight and physical exercise for 150 min per week to delay the onset of diabetes mellitus. (4A)</p> <p>2 Patients should be given the possibility to participate in adapted educational programmes focused on wishes and needs of the older patient. (3A)</p> <p>3 We suggest that a diet rich in fruits, vegetables and high-fiber foods, smoking cessation and low alcohol consumption should be encouraged. (2A)</p> <p>4 Physical exercise is mandatory for older persons with diabetes and should contain elements of prevention of frailty and falls. We recommend resistance exercise training combined with protein rich diet (if renal function is satisfactory) to maintain muscle function. (3A)</p> <p>5 Functionally impaired persons with diabetes, especially those with frailty or pre-frailty, should be offered training for strength and endurance. (3A)</p> <p>6 We suggest that encouragement to enhance physical activity should be given to all older persons with diabetes. (1A)</p> <p>7 We suggest that in general no restrictive diet should be recommended. We suggest that antihyperglycemic therapy should be adapted to the nutritional wishes, and the health and social needs of each older person with diabetes. (1A)</p> <p>8 We suggest that all older people with diabetes particularly those residents in care homes or who have frailty or significant medical comorbidities be considered for vaccination for the following (according to local, national and/or international guidance): influenza, pneumococcal disease, Covid-19, herpes zoster, tetanus, pertussis, and diphtheria. (1A)</p> <p>9 We recommend prevention, screening and early treatment of periodontal diseases and general education on oral hygiene in older people with diabetes. (4A)</p>
<p>Comprehensive functional evaluation</p>	<p>1 We recommend that comprehensive functional evaluation, which involves assessment of physical function and screening for frailty, should be incorporated in the routine primary care for older people with diabetes. (3A)</p> <p>2 We recommend that the tools for physical function assessment and frailty screening should be clinically validated, easy</p>

	<p>to do, quick to perform and do not require professional staff involvement. (3A)</p> <p>3 We suggest that health care professionals should be educated about the impact of diabetes on a patient’s functional status and the importance of regular screening for physical dysfunction and frailty. (1A)</p> <p>4 We recommend that patients with physical dysfunction or identified as pre-frail or frail should receive further medical assessment and appropriate interventions. (3A)</p>
Treatment Recommendations	
Managing cardiovascular risk	<p>1 In older people with diabetes, general lifestyle and management recommendations apply: smoking cessation, heart healthy diet and increased physical activity; hypertension and dyslipidemia must be treated with individualized goals and preventive purposes. (4A)</p> <p>2 Benefit of weight reduction should be discussed according to the patient’s needs and if necessary combined diet and physical activity program with resistance training should be used to reduce the risk of sarcopenia. (3A)</p> <p>3 Patients should be trained to identify an irregular pulse, and annual ECG can be recommended for people with diabetes because of increased risk of atrial fibrillation. In case of no contra-indications, direct-acting anticoagulants should be preferred to warfarin. (4A)</p> <p>4 SGLT2 inhibitors or GLP-1 agonist prescriptions should be considered in the older patient at risk, however this should be with caution due to the low level of clinical experience in subjects older than 80 years. (3A)</p>
Glucose regulation with oral and non-insulin injectable agents	<p>1 In the absence of significant cardiovascular disease and/or chronic renal disease, we recommend metformin as a first line therapy in older people with diabetes due to its low risk of hypoglycaemia and cardiovascular safety. (3A)</p> <p>2 We suggest a cautious use of sulfonylureas and glinides if the risk of hypoglycaemia is low. (2A)</p> <p>3 We suggest the cautious use of pioglitazone but it is best avoided in patients with heart failure and volume overload. (3A).</p> <p>4 We recommend the use of dipeptidyl peptidase-4 (DPP-4) inhibitors particularly in subjects with frailty due to their low risk of hypoglycaemia and a reasonable side-effect safety profile. (3A)</p> <p>5 We recommend the use of the sodium glucose co-transporter-2 (SGLT-2) inhibitors and glucagon like peptide-1 receptor agonists (GLP-1RA) due to their lower risk of hypoglycaemia and cardiovascular benefit as part of an escalation in therapy. SGLT-2 inhibitors also have additional renal benefits. These agents are best avoided in frail older people who may have significant weight loss and anorexia. (4A)</p> <p>6 We recommend regular monitoring of renal function during metformin, SGLT-2 and GLP-1RA therapy to avoid the risk of acute kidney injury and dehydration. (3A)</p>
Insulin therapy	<p>1 Switching to treatment with insulin is suggested in</p> <p>a. failure of oral treatment to control diabetes.</p>

	<p>b. relative contra-indications to oral treatment (e.g. renal insufficiency).</p> <p>c. in order to reduce adverse events from treatment including polypharmacotherapy. (1A)</p> <p>2 We suggest the use of insulin in case of involuntary weight loss under oral antidiabetic therapy. (1A)</p> <p>3 Insulin can be efficiently and safely used in combination with other agents such as metformin, DPP-4 inhibitors or SGLT-2-inhibitors. (3A)</p> <p>4 We suggest the cautious use of long-acting basal insulin given once daily in the morning where there are stable meal patterns and little evidence of frailty. (1A)</p> <p>5 We suggest the use of twice daily combination or pre-mixed insulin where a once daily insulin regimen fails to achieve targets. (2A)</p> <p>6 In the long term, addition of short-acting insulin at one or more meal times, as part of a basal-bolus approach may be necessary to achieve blood glucose control. (3A)</p> <p>7 We suggest the cautious use of insulin-GLP-1 RA combinations to avoid having complex insulin regimens. (2A)</p> <p>8 Testing of cognition, visual acuity and fine motor skills is recommended in older persons who self-inject insulin. (3A)</p> <p>9 An Individualized insulin dosage protocol must be provided to each older patient. (3A)</p> <p>10 Appropriate staff training must be organized to improve insulin dosage administration in those who require assistance or who are dependent such as those who are housebound or resident in a care home. (3A)</p>
<p>Hypoglycaemia Avoidance</p>	<p>1 We suggest that all health professionals involved in the care of older patients with type 2 diabetes should assess the risk of hypoglycaemia and adjust glycaemic targets to levels appropriate to the functional capacity, comorbid load, frailty level and life-expectancy of the individual. (2A)</p> <p>2 We recommend that all older people should have regular medicines reviews to assess potential hypoglycaemic risks. This should include: minimising exposure to sulphonylureas (particularly long-acting agents; using low risk insulin regimens such as once daily NPH or long-acting analogue; and reducing polypharmacy. (3A)</p> <p>3 We recommend that all insulin treated patients should be assessed for capacity to self-administer, where this is not possible third-party administration should be considered. It is important to ensure good education support for both patients and carers in respect of injection timing and blood glucose monitoring. (3A)</p> <p>4 We suggest that all patients at high risk (low glycated haemoglobin or frailty) or those that experience either frequent or severe hypoglycaemia should be subject to a multidisciplinary review to reduce exposure to hypoglycaemic agents and to assess cognitive capacity in respect of medicines safety. (2A)</p> <p>5 We suggest that extra vigilance of hypoglycaemia is required in patients with type 1 diabetes of older age, as they may</p>

	<p>become hypoglycaemia unaware and their physiological response is blunted. This may require changes in glucose targets, correction factors, insulin dose and mode of delivery. In severe cases glucose sensors may be indicated. (2A)</p> <p>6 We suggest that systematic approaches to identify older people at risk of hypoglycaemia should be considered, and where possible, integrated with the monitoring of severe hypoglycaemic events in the local population (ambulance call outs, emergency department attendance or hospital admission). Such events should be investigated, and compensatory strategies implemented to prevent further occurrences and to inform systemic learning on how to minimise such events in the care system generally. (1A)</p>
Deprescribing and De-escalation of Glucose-lowering Therapy	<p>1 We suggest that deprescribing antidiabetic drugs should be considered if the patient's glycated hemoglobin level falls below 6.5% (48 mmol/mol), or below 7.0% (53 mmol/mol) in the presence of frailty. (1A)</p> <p>2 We suggest that older adults with type 2 diabetes who have dementia, moderate to severe frailty, significant renal impairment, high levels of multimorbidity, etc (see Box 2) may particularly benefit from a de-prescribing policy. (1A)</p> <p>3 We suggest that older adults with type 2 diabetes and frequent hypoglycaemia on complex insulin regimens should be reviewed for consideration of de-prescribing. (2A)</p>
Blood pressure regulation	<p>1 Physical activity and sensible control of weight (avoiding malnutrition and sarcopaenia) must be promoted in older patients with diabetes to prevent or manage hypertension. (3A)</p> <p>2 We suggest that all patients should be informed of the benefits of reducing salt and alcohol consumption. (1A)</p> <p>3 In older patients with diabetes the global strategy of anti-hypertensive treatment is similar to that in patients without diabetes. (4A)</p> <p>4 Community-living, older hypertensive patients, with diabetes, who are functionally independent, and in a stable condition can be treated according to current international recommendations for non-diabetic people older than 65 years. (4A)</p> <p>5 The goal for treatment in well-functioning older people with diabetes may be as low as SBP < 120mmHg but in moderately frail subjects a benefit can be achieved with higher SBP goals (up to 150mmHg). (4A)</p> <p>6 We suggest that in very frail older people with diabetes, treatment decisions must be individualized and based on comprehensive geriatric assessment. (1A)</p> <p>7 First line drugs are ACE inhibitors/ ARBs, calcium blockers or diuretics. Beta-blockers are second-line drugs and indicated when the patient has coronary disease, heart failure or permanent atrial fibrillation. (4A)</p>
Plasma lipid regulation	<p>1 In subjects with no history of cardiovascular disease, a statin should be offered to patients with an abnormal lipid profile (high LDL and/or abnormal HDL) when their life-expectancy (determined by their functional status) is over 5 years. (2A)</p>

	<p>2 In subjects with no history of cardiovascular disease but a life-expectancy lower than 5 years (very frail patients or very old patients, >84 years), we suggest that lipid-lowering therapy should only be considered under specialist advice because of the relative lack of benefit in those with diabetes after age 84 years. (2A)</p> <p>3 A statin should be offered to patients with an abnormal lipid profile who have proven cardiovascular disease. (4A)</p> <p>4 Consider statin therapy in older subjects with diabetes to reduce the risk of ischaemic heart disease and stroke as part of secondary prevention of cardiovascular disease. (3A)</p> <p>5 A fibrate should be considered in patients with an abnormal lipid profile who have been treated with a statin for at least 6 months but in whom the triglyceride level remains elevated (≥ 2.3 mmol/l). (2A)</p>
<p>Digital Health and Diabetes Care</p>	<p>1 To enhance the quality of community diabetes care delivered to older people, we suggest that all stakeholders including primary care use the full range of digital communication tools, shared health care records, and digital diagnostic equipment available to them with the key purposes of maintaining functional status, reducing unnecessary hospital admissions, and meeting agreed glycaemic targets. 1A</p> <p>2 We suggest that all able older people with diabetes receive education and instruction to use a diabetes-management app on a mobile phone, tablet, or computer to support their personalised diabetes care plan. 1A</p> <p>3 We suggest that a diabetes management app for older people should include the following elements of care and intervention: glucose levels, oximetry, nutritional plan, exercise plan, blood pressure record, hypoglycaemia alert messages, help with insulin dosages, contact telephone and SMS text messaging to GP practice and community nurses, sick day rules. 1A</p> <p>4 Tele-medicine consultations should be proposed for older people with limited access to medical care to improve diabetes control without an undue increased risk of hypoglycaemia. 3A</p>
<p>Complications</p>	
<p>Management of acute illness including Covid-19</p>	<p>1 Older subjects with T2DM should be encouraged to receive Covid-19 immunization. (4A)</p> <p>2 Blood glucose must be kept within agreed target ranges to decrease the risk of any infection or the risk of severe Covid-19 infection. (3A)</p> <p>3 We suggest that the frequency of monitoring of blood glucose and blood pressure should be agreed and undertaken as a minimum twice daily (blood glucose) and daily (blood pressure). This should be maintained and reinforced during these periods. (2A)</p> <p>4 With T2DM, we suggest that corticosteroid treatment needs close monitoring and frequent correction of blood glucose, Na and K, and the state of hydration must be monitored. (2A)</p> <p>5 We suggest that care homes that manage sufficient residents with diabetes and have suitable medical equipment,</p>

	<p>should attempt to upskill with training and education to manage the acute care of residents with covid-19 including corticosteroid and oxygen therapy as an alternative to hospitalization in selected cases. (1A)</p>
<p>Depressive illness and mood states</p>	<p>1 The assessment of depressive and anxiety symptoms in older people with diabetes can be performed on an annual basis using validated assessment tools such as the short form Geriatric Depression Score or the PHQ-9. (3A)</p> <p>2 Pharmacological treatment of depression in older patients with diabetes should be tailored with consideration of the side effects of antidepressant medications on metabolic outcomes, such as weight gain. (3A)</p> <p>3 In older patients with diabetes and depression, the use of antidepressants should be used taking into account any prevailing cardiovascular risk factors, particularly the presence of cardiac arrhythmias and conduction disorders. (4A)</p> <p>4 We suggest that the specialist-prescribed use of anxiolytic medications in people with diabetes should be strictly monitored since these medications may increase blood glucose levels. (3A)</p>
<p>Diabetes, Cognitive dysfunction and Dementia</p>	<p>1 We suggest that at the time of diagnosis and at regular intervals thereafter, patients aged 70 years and over should be screened for the presence of cognitive impairment using a structured approach (including use of age-, language-, culturally-validated screening tools such as the MoCA, MiniCog, MiniMental State Examination Score). (2A)</p> <p>2 In older patients with established risk factors for cognitive impairment, a risk score can be applied to estimate the risk of cognitive impairment. (3A)</p> <p>3 The detection of frailty and complex multimorbid profiles may help to identify older people with diabetes at greater risk of developing cognitive impairment. (3A)</p> <p>4 Prevention of repeated hypoglycaemia in older patients with diabetes may decrease the risk of developing cognitive impairment or dementia. (2A)</p> <p>5 A full medical assessment is required in older people with diabetes to exclude common reversible causes of cognitive impairment such as delirium, medication side-effects, metabolic or endocrine disturbances, sleep problems, and depressive disorder. (4A)</p> <p>6 Optimal glucose and blood pressure regulation should be aimed for in older patients with diabetes to maintain cognitive performance and improve learning and memory. (3A)</p> <p>7 We suggest that in order to maintain diabetes self-care ability, older subjects with diabetes should be screening at regular intervals for cognitive impairment. (2A)</p> <p>8 For older people with diabetes who are suspected of having cognitive impairment, referral to a multidisciplinary specialist diagnostic and evaluation service is required. (4A)</p> <p>9 Best practice guidelines are available for diabetes healthcare professionals caring for people with diabetes and</p>

	<p>cognitive impairment or dementia and these should guide current management (2A)</p> <p>10 Several interventions including adapted self-management curricula, problem-solving and behavioural interventions may play a role in managing older adults with type 2 diabetes and cognitive impairment (3A)</p>
Vascular disease	<p>1 Screening and effective treatment of CVD must be undertaken in older people with diabetes, including the use of drug treatment of CVD risk factors and revascularization procedures when indicated. (4A)</p> <p>2 Prevention of stroke in diabetes includes comprehensive treatment of risk factors, hypertension, dyslipidemia and smoking, and anticoagulation in case of atrial fibrillation or antiplatelet drug in secondary prevention. <i>Please note: Routine antiplatelet therapy in diabetes without clinical vascular disease is not recommended.</i> (4A)</p> <p>3 In older people with diabetes, diabetic kidney disease can progress rapidly, and renal function should be assessed annually. (4A)</p> <p>4 ACE inhibitors/ARBs are indicated for prevention and treatment of diabetic kidney disease in older people with diabetes. (4A)</p> <p>5 In view of favourable reno-protective effects, SGLT2-inhibitors should be used independently of their hypoglycaemic effect to prevent worsening of renal function. 4A</p> <p>6 We recommend the examination of the feet of all patients with diabetes annually for the presence of peripheral artery disease (PAD), even in the absence of foot ulceration. At a minimum, this should include taking a relevant history and palpating foot pulses. (3A)</p> <p>7 We recommend a multidisciplinary foot approach to diabetic foot disease for advanced lesion rescue. (4A)</p>
Visual Loss	<p>1 We recommend that older people should have a full ophthalmological examination which includes visual acuity and retinal photography on the initial diagnosis of diabetes and annually thereafter. (3A)</p> <p>2 We recommend that patients and health care professionals should be educated about the ophthalmological complications of diabetes in older people and the importance of timely screening and early treatment. (3A)</p> <p>3 We recommend control of metabolic risk factors such as hyperglycaemia, hypertension and dyslipidaemia that may help reduce the risk of diabetic retinopathy. (3A)</p> <p>4 We suggest the use of mobile optometric service or digital tele-retinal imaging for care homes residents or less mobile older people. (1A)</p>
Women’s sexual health and erectile dysfunction	<p>1 We suggest that older persons with diabetes should benefit from sexual dysfunction screening with the use of questionnaires assessment using the International Inventory of Erectile Function in men and Female Sexual Function Index in women. (1A)</p>

	<p>2 We suggest that sexual dysfunction should be managed using an integrated approach with respect to the willingness and cooperation of the older person with diabetes. (1A)</p> <p>3 Older men with diabetes with ED should be offered a treatment with an oral phosphodiesterase-5 inhibitor. In case of insufficient response a vacuum erection device should be proposed. (4A)</p>
<p>Peripheral Neuropathy and Pain</p>	<p>1 At the time of diagnosis and at regular intervals (annually) thereafter older patients with diabetes should be questioned about symptoms of neuropathy and examined for the presence of peripheral neuropathy using as a minimum an assessment by a 128 Hz (cycles per second) tuning fork for vibration, a test of pin-prick sensation and a 10 g Semmes-Weinstein mono filament test for pressure perception. (3A)</p> <p>2 In assessing neuropathic pain in older patients, we suggest that the use of instruments specifically designed for neuropathic pain (e.g. the Brief Pain Directory for Diabetic Peripheral Neuropathy) can provide important insight into patients' pain experience and is recommended. (2A)</p> <p>3 Pregabalin can be used for painful diabetic neuropathy, starting at the lowest dose (50 mg twice a day) and then slowly increased, since with higher doses there was showed not only an increase in effectiveness but also an increase in the incidence of most adverse events (somnolence and dizziness most frequently). (4A)</p> <p>4 Duloxetine can be considered as an alternative treatment for diabetes-related neuropathic pain (significant improvement in pain against placebo). However, there is no evidence enough to recommend Venlafaxine for diabetes-related neuropathic pain. Other tricyclic drugs are not recommended in older people due to their anticholinergic side effects. (4A)</p> <p>5 In those older people with diabetes who are not able to communicate well (such as loss of vision, hearing, dementia, care home residency), we suggest that the use of an instrument to detect early peripheral nerve damage (e.g. Neuropad) which does not rely on verbal response may be helpful. (2A)</p>
<p>Falls and Immobility</p>	<p>1 Measurements of hand grip force using a standard device, such as a Jamar dynamometer, in the risk assessment of falls and fractures due to sarcopaenia and motor neuropathy should be performed at least twice a year during routine clinical assessment. (4A)</p> <p>2 All older adults with T2DM should have access to appropriate nutritional and exercise interventions, according to their level of functional status: correcting low vitamin D levels would improve muscle strength and decrease the frequency of falls. (3A)</p> <p>3 In older adults with T2DM at increased risk of falls, glycaemic treatment and co-morbidity drug regimens should be personalized, with periodic adjustment of care plans, trying to minimize any drug-related risk of falls and to maintain a reasonably good quality of life. (3A)</p>

	<p>4 Patients with repeated falls should receive a multifactorial risk assessment, with the inclusion of a Frailty Measurement (Frailty score or eFI). (3A)</p>
Special Categories	
Housebound and Frail	<p>1 Patients who are housebound and frail should receive an easy-to-administer, quick, validated multifactorial risk assessment, not requiring special equipment nor professional staff (such as the electronic Frailty Index). (3A)</p> <p>2 Those patients with selected functional, cognitive, nutritional impairments, at risk of pressure sores or of complications due to polypharmacy should undergo a comprehensive geriatric assessment tool (e.g. the Multidimensional Prognostic Index) by a clinician to detect and treat underlying reversible conditions, such as malnutrition, anaemia, or depression. (3A)</p> <p>3 Appropriate nutritional and exercise interventions should be prescribed when applicable, based on the overall functional status of the patient. (3A)</p> <p>4 Glycaemic treatment and co-morbidity drug regimens should be personalised, with periodic adjustment of care plans, as well as trying to minimize any drug-related risk and to maintain a reasonably good quality of life. (3A)</p> <p>5 We recommend a multimodal intervention (resistance exercise, nutritional education, optimizing medical treatment) in the medical management of frailty in type 2 diabetes. (3A)</p>
Avoiding Hospitalisation	<p>1 Comprehensive management of diabetes and comorbidity decreases the risk of unplanned hospitalisations. (3A)</p> <p>2 Hypoglycemia risk must be assessed in all older patients with diabetes to minimize unnecessary admission to hospital. (3A)</p> <p>3 We suggest that regular review by a geriatrician and/or diabetes specialist, video support 24/7, integrated care and telephone advice can help prevent 15% emergency hospital admissions from care homes. (2A)</p> <p>4 We suggest that close working between the primary care team and care home staff should identify at-risk residents for hospital admissions and take appropriate measures such as assessing hypoglycaemic risk, frailty, and setting glucose targets to reduce unplanned admissions. (1A)</p>
Care Home Management of diabetes	<p>1 In view of the high rate of undiagnosed diabetes in care home residents at the time of admission to a care home, each resident requires to be screened for the presence of diabetes, and have annual screens for diabetes. (3A)</p> <p>2 At the time of admission to a care home, we suggest that each resident with diabetes should be screened for cognitive and physical impairment including frailty as they are at higher risk to progression to disability. (2A)</p> <p>3 Residents on insulin or insulin secretagogues must have a hypoglycaemic risk assessment, and screened regularly for the presence of hypoglycaemia symptoms. (3A)</p>

	<p>4 We suggest that each resident with diabetes should aim for optimal blood pressure and glucose regulation in order to maintain cognitive and physical performance. (2A)</p> <p>5 We suggest that each resident should have an individualised plan of management that includes an exercise plan and nutritional plan which takes into account their beliefs, culture, ethnicity and personal wishes. (2A)</p> <p>6 We suggest that a range of interventions can be considered to assist management of care home residents with diabetes such as adherence to clinical practice guidelines, de-escalation of therapy, medical optimisation and resident education, teleconsultation between specialist and care staff, and the use of basal bolus insulin regimens or basal insulin regimen only. (2A)</p> <p>7 WE suggest that clinicians can engage with a number of clinical guidelines to guide diabetes management in care home settings. (2A)</p>
<p>End of life diabetes care</p>	<p>1 We suggest that interventions in diabetes end of life care in older people need to be tailored to patient preferences and aiming at the prevention of hypoglycaemia, preventing acute metabolic decompensation, and acute hyperglycaemia symptoms (e.g. excessive thirst and excessive urination) whilst at all costs preserving a patients' quality of life, comfort and dignity. (2A)</p> <p>2 We suggest that for older subjects in palliative care, maintaining blood glucose levels above 6 mmol/l will help to minimize hypoglycaemia. Maintaining blood glucose levels between 6-12 mmol/l should help to prevent symptoms of hyperglycaemia. (2A)</p> <p>3 We suggest that during palliative care of frail and bedridden subjects, it is important to adopt a robust preventative strategy to minimize the development of diabetic ulcers, feet infections and pressure ulcers prevention.(1A)</p> <p>4 We suggest that once an older adult with diabetes enters an end of life care phase, both the diabetes team and palliative care team discuss future management as part of a close liaison approach. (2A)</p> <p>5 Advance care planning and documenting one's values, goals, and care preferences early is important and helps health professionals and other treatment decision-makers make informed decisions that reflect the individual's values and care goals and preferences. (1A)</p>

Recommendations that Enhance the Practice and Quality of Primary Care Management of Diabetes

Aims of Care

Recommendations

- 1 We suggest that the aims of care should be aligned with the health and social needs of the person with diabetes and be based on an evaluation of functional status and comorbidity profile including a comprehensive geriatric assessment using a precision medicine approach. (1A)
- 2 We suggest that a patient-centered and individualized care plan needs to be updated at regular intervals and its importance clearly explained to the patient. (1A)
- 3 The prevailing level of glycaemia of an older person with diabetes is of utmost importance. We recommend a HbA1c target of 53-58 mmol/mol in someone without frailty or dementia and without significant associated medical comorbidities. (3A)

Rationale and evidence base

Diabetes mellitus is a long-term chronic disease process that impairs multiple body systems and organs. It has also been defined as a disabling disease that is associated to frailty¹ and higher mortality rates. In addition, it's known to impair the quality of life of patients who, in some studies, have expressed a need for social support.² An epidemiologic study investigating newly diagnosed diabetes in adults identified 5 replicable clusters of patients with diabetes based on insulin secretion reserves (HOMA-B), insulin-resistance (HOMA-IR), glutamate decarboxylase antibodies, HbA1c values, BMI, and age at diagnosis.³ The subgroups were found to have different risk of diabetic complication profiles.⁴ In fact, individuals with autoimmune or severe insulin deficiency diabetes more frequently developed diabetic retinopathy, while those with severe insulin resistant diabetes had higher rates of kidney insufficiency.⁴ Comorbidities, other risk factors for impaired ageing and blood glucose levels all need to be monitored.

Given the high heterogeneity and clinical complexity of older patients with diabetes, these individuals need to undergo a comprehensive assessment, including a gerontological evaluation using a precision medicine approach in the effort to uncover and meet their needs. The care plan should address the expectations of the patient and also take into consideration his/her socio-economic status and living conditions. This model is a patient-centered care approach. Given the disease's chronic nature, the care plan, which should be continuously evolving, needs to be updated at regular intervals and clearly explained to the patient.

The blood glucose target should be set depending on several factors, such as the pathogenesis of the hyperglycemia, the patient's nutritional status, physical activity level, self-care ability and motivation, as well as the burden of hypoglycemic treatments, the presence of complications, and the long-term effects of diabetes. There is a J-shaped relationship between HbA1c levels and all-cause mortality: mortality is higher when the HbA1c value is below 48mmol/mol and when it is higher than 53 mmol/mol.⁵⁻⁷ It has been demonstrated that intensive treatment augments the risk of severe hypoglycemia, while no evidence of benefit, particularly in those older than 80 years has been reported.⁸

More recently, an evidenced-based review of diabetes in older people cited the following revised goals of care (see Box 1).⁹

Box 1: Goals of care

- Mandatory individualized management plan that takes into consideration different functional and comorbid categories, and duration of diabetes.
- Evidence-based prescribing for glucose-lowering agents and setting appropriate targets adjusted according to the category and wish of the person with diabetes.
- Proactive shared commitment to reduce the risk of cardiovascular disease and other non-cardiac vascular disorders, renal failure, visual loss, cognitive dysfunction, mobility disorder, functional decline and the development of frailty or disability.

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Monitoring

Recommendations

- 1 Self-monitoring of blood glucose (SMBG) should only be routinely recommended in older people with type 1 diabetes (3A)
- 2 We suggest that SMBG should be considered in the following groups:
 - a. Older people with type 2 diabetes on insulin therapy. (2A)
 - b. Older people with diabetes on oral hypoglycaemic therapy that have high hypoglycaemic risk potential. (2A)
 - c. Older patients with diabetes on any hypoglycaemic therapy but having frequent episodes of hypoglycaemia. (2A)
 - d. Older people with diabetes during acute illness or poor glycaemic control that needs significant adjustment of hypoglycaemic therapy. (2A)
- 3 We suggest that continuous glucose monitoring (CGM) should be considered in patients with significant glycaemic variability. (2A)
- 4 We suggest that assessment of physical and cognitive functions along with education are required before planning glucose monitoring. (1A)

Rationale and evidence base

Monitoring of blood glucose is an integral part of diabetes management that is crucial for hypoglycaemic therapy prescriptions to achieve adequate glycaemic control. Self-monitoring of blood glucose (SMBG) is a reflection for the short-term blood glucose levels and HbA1c is a reflection

for the long-term glycaemic control. The role of SMBG may be useful in patients on insulin therapy or those on oral hypoglycaemic agents with high hypoglycaemic risk potential or during acute illness, otherwise its value is less clear.¹ It may have value in the initial titration of hypoglycaemic therapy on diagnosis but it is likely not to be required as a long-term monitoring tool, to avoid frequent finger pricking and maintain quality of life, in most patients with type 2 diabetes and stable glycaemia.¹

Continuous glucose monitoring (CGM) is another technology that adds more information about the time spent in the target range or the severity, frequency and duration of hyper and hypoglycaemic episodes.² Hypoglycaemia is common in older people with diabetes especially asymptomatic episodes that can be associated with adverse events such as injurious falls, cerebrovascular and cardiovascular complications.³ Relaxed glycaemic targets are not an assurance of a lower risk of hypoglycaemia as CGM has unmasked frequent episodes of hypoglycaemia in older people with higher HbA1c levels.⁴ CGM is suitable in patients with type 1 diabetes or type 2 diabetes on insulin and/or oral therapy with significant glycaemic variability.^{5,6}

CGM has been shown to be associated with a reduction of diabetes-related stress and an improvement in well-being.³ Glucose monitoring will need informed discussion between clinicians and patients with particular attention to patient goals to avoid unnecessary burden and to maintain quality of life. Also, physical and cognitive functions of patients and their carers should be considered when planning glucose monitoring.

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Screening and Diagnosis

Recommendations

- 1 A diagnosis of T2DM is based on at least 2 fasting blood glucose measures $\geq 7\text{mmol/l}$ or any-time blood glucose $\geq 11\text{mmol/l}$. An HbA1c value $\geq 48\text{mmol/mol}$ (6.5%) may also be used to diagnose T2DM but fasting glycaemia should always be determined. (World Health Organization, WHO) (4A)
- 2 At diagnosis, a patient metabolic profile must be assessed: BMI and search for recent weight loss, HbA1c, lipid profile, and estimate of muscle mass such as mid-calf or mid-arm circumference if DEXA or CT scans are not available. (4A)
- 3 In the presence of rapidly increasing symptomatic glycaemia, an autoimmune form of DM (Latent Autoimmune Diabetes in the Adult, LADA) should be suspected and confirmed with measure of anti-insulin antibodies. (3A)
- 4 Screening for diabetes must be considered in the following circumstances: delirium and/or vascular dementia, repeated infections specially mycosis, high dose treatment with corticosteroids, presence of macrovascular conditions (coronary, cerebrovascular, peripheral) or significant microvascular conditions (retinopathy, neuropathy, nephropathy), autonomic abnormalities, prolonged treatment with atypical antipsychotics, progressive weight loss and frailty. (4A)
- 1 In older subjects without symptoms and with potential benefits from early detection of diabetes, we suggest that screening should be proposed at regular intervals such as every three years. (1A)

Rationale and evidence base

Normal ageing is associated with a progressive increase in HbA1c. Post-prandial blood glucose tends to increase.¹ Indeed, older age and obesity are risks for discrepancies between fasting blood glucose and HbA1c criteria to diagnose diabetes.² In most cases in older subjects with normal fasting glycaemia determination or high post-75 g glucose challenge glycaemia will not change disease management. Latent Autoimmune Diabetes in the Adult (LADA) presents with similar risk factors as T2DM³ but display rapid metabolic worsening and usually requires rapid insulin instauration for adequate glycemic control.

The risk of T2DM incidence does not appear to differ according to age grouping in older age but being overweight and adverse factors that create a poor quality of life are risk factors for it.⁴ Number of tools

exist to estimate the risk of developing diabetes. However, these scores' efficiency may vary depending the population used for estimation and people older than 75 years were not considered in these studies.⁵

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Lifestyle and Prevention of Diabetes including Immunisation

Recommendations

- 1 We recommend achieving ideal body weight and physical exercise for 150 min per week to delay the onset of diabetes mellitus. (4A)
- 2 Patients should be given the possibility to participate in adapted educational programmes focused on wishes and needs of the older patient. (3A)
- 3 We suggest that a diet rich in fruits, vegetables and high-fiber foods, smoking cessation and low alcohol consumption should be encouraged. (2A)
- 4 Physical exercise is mandatory for older persons with diabetes and should contain elements of prevention of frailty and falls. We recommend resistance exercise training combined with protein rich diet (if renal function is satisfactory) to maintain muscle function. (3A)
- 5 Functionally impaired persons with diabetes, especially those with frailty or pre-frailty, should be offered training for strength and endurance. (3A)
- 6 We suggest that encouragement to enhance physical activity should be given to all older persons with diabetes. (1A)

7 We suggest that in general no restrictive diet should be recommended. We suggest that antihyperglycemic therapy should be adapted to the nutritional wishes, and the health and social needs of each older person with diabetes. (1A)

8 We suggest that all older people with diabetes particularly those residents in care homes or who have frailty or significant medical comorbidities be considered for vaccination for the following (according to local, national and/or international guidance): influenza, pneumococcal disease, Covid-19, herpes zoster, tetanus, pertussis, and diphtheria. (1A)

9 We recommend prevention, screening and early treatment of periodontal diseases and general education on oral hygiene in older people with diabetes. (4A)

Rationale and evidence base

Lifestyle and prevention

Diabetes is associated with muscle mass loss and visceral fat gain. Exercise may improve body composition along with function by increasing muscle mass and reducing visceral fat leading to improvement in insulin sensibility. The look AHEAD (Action for Health in Diabetes) study, intensive life style (ILS) intervention significantly increased probability of diabetes remission and improved other clinical outcomes in overweight or obese subjects with T2DM and aged 45-75 years old.¹ In the diabetes prevention programme outcomes study, participants in the ILS intervention arm that aimed for 7% weight loss and 150 minutes weekly of moderate exercise continued to benefit from reduced diabetes incidence during the long follow up period and were 25% less likely to develop the disease after 22 years of enrolment compared with the placebo group.²

Diabetes education

Not only the chronological age, but especially the physical and psychological function determines whether a common educational programme targeting middle-aged people with diabetes or a programme designed specifically for older people with cognitive impairments as well (e.g. SGS)³ should be used. A nurse-led educational programme has been shown to improve metabolic profile especially in people ≥ 65 years old compared to usual care.⁴

Educational programmes for older people allow making long-lasting improvements to diabetes treatment. The topics should be focused on participants' individual needs and wishes.⁵ Examples given are appropriate capacities in self-management of measuring blood glucose or insulin therapy, recognition of hypoglycemia but also strategies to prevent frailty, falls or dementia. Therefore, the presence and possible amelioration of geriatric syndromes should always be included.⁶

A select few articles were able to show the benefits of telemedical education in older persons.⁷

Exercise

People with diabetes suffer from falls and fractures more frequently than people without diabetes.⁸ Resistance training particularly dynamic exercise improved muscle strength, dynamic balance, and physical function in comorbid older people with diabetes.⁹ A combined intervention with education, diet recommendations and interval training with exercise equipment was able to preserve physical functioning in comparison with routine care.¹⁰

Nutrition

In general, the nutritional recommendations for older people with diabetes do not differ from those for older people without diabetes. In selected patients, with insulin resistance, weight loss might be beneficial and then diet should be combined with a physical activity program.¹¹ The Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) has also demonstrated a beneficial effect of exercise and nutrition on cognitive function in older people with T2DM.¹² A Mediterranean diet, especially high intake of vegetables, fruits and high-fiber foods, was associated with reduced risk of frailty syndrome in older women with T2DM.¹³

The risk of malnutrition can be evaluated by use of Mini Nutritional Assessment (MNA). In underweight patients, the causes should be explored and, if possible, eliminated. Older persons with unintended weight loss and diabetes should eat a normal high protein and high caloric food. Antihyperglycemic therapy should be adapted to nutritional wishes and needs. Excessive alcohol consumption should be discouraged as it inhibits gluconeogenesis, causes hypoglycaemia and results in neglecting diabetes self-care.

Immunisation

People with diabetes have an increased susceptibility to infections, due to impairments in the immune system.¹⁴ Diabetes is associated with a more severe course of various infectious diseases and a worsening of the overall health status, increasing the risk of hospitalization and death compared with euglycemic subjects¹⁵ Influenza vaccination is associated with a significant improvement in outcomes in people with diabetes, reducing the risk of hospitalization for stroke, heart failure, influenza, pneumonia and all-cause mortality.¹⁶

Diabetes is also associated with an increased incidence of hospitalizations secondary to pneumonia and pneumococcal vaccination is associated with a reduction of risk of pneumonia, hospitalizations, and respiratory failure.¹⁷

Moreover, diabetes is an important risk factor for herpes zoster (HZ) infection and post-herpetic neuralgia¹⁸ Anti-HZ vaccination is proven effective in decreasing the incidence and severity of the HZ infection in older patients.¹⁹

Boosters for diphtheria, tetanus and pertussis are also recommended in older patients with diabetes, in consideration of the increased susceptibility of diabetic patients to developing severe and complicated infectious diseases.²⁰ Finally, the recent COVID-19 pandemic has shown that older adults with diabetes are at higher risk of adverse outcomes and mortality and they should be prioritized for vaccination.²¹

Individual vaccine recommendations may vary among different European countries and clinicians should consult their own national vaccination policies.

Table 2: Comprehensive Vaccination Schedule for Older People with Diabetes

Name of Vaccine- Preventable Disease	Comments
Influenza	Annual process; usually inactivated vaccine given; about 5% have reactions – usually upper respiratory tract infections; about 1 in 10 only care home residents may respond positively with seroconversion although higher vaccine doses and better nutrition may improve these results. Mortality does not appear to be affected in older people above 85 years of age
Pneumococcal Infection	To protect against streptococcus pneumoniae predominantly; 23-valent Pneumococcal polysaccharide vaccine is used in most European countries for adults aged over 60 years; although there is a great variability in European pneumococcal vaccination guidelines. Efficacy varying with age of the population and is 0-22% in those aged 85 years and over ¹ ; antibody levels wane after 5 years but repeated vaccination in older people is not known at present to confer any further benefit. A 2010 placebo-controlled RCT ²³ from Japan has demonstrated reduced pneumococcal pneumonia and mortality in nursing home residents given the vaccine.
Herpes Zoster (Shingles)	Shingles generally occurs in those older than 70 years where the disease can be quite debilitating and painful. ²² A complication called post-herpetic neuralgia can be as frequent as 1 in 2 people aged 80 years and over. The use of the vaccine has dramatically cut the incidence of both shingles (by a half) and post-herpetic neuralgia (by two thirds).
Covid -19	During the last 18 months there has been a major campaign to double vaccinate all eligible care home residents with one of the approved covid-19 vaccines (e.g.). Booster doses are planned from Autumn 2021 in some countries. In nursing homes, care staff are being asked to ensure they are double vaccinated against covid.
Hepatitis B	<i>Advised in the United States for adults with diabetes to prevent hepatitis B virus infection which can cause lifelong infection, hepatic cirrhosis, liver cancer and failure, and death.³ No information available on using hepatitis B vaccination in older people with diabetes within European states. .</i>
Diphtheria, Tetanus and Pertussis	<i>Advised in the United States for adults with diabetes to protect against these diseases. All adults who have never received this vaccine should receive a dose. Booster doses can be given every 10 years or after 5 years if a deep infected wound has occurred. The practice of offering this vaccine in older people with diabetes within Europe is unknown.</i>

Oral health

Diabetes increases the risk of periodontal disease and subsequent infections; poor oral health is associated deterioration in glucose control and vice versa.²⁵ Better quality of life is expected with good oral hygiene.²⁶

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Comprehensive functional evaluation

Recommendations

- 1 We recommend that comprehensive functional evaluation, which involves assessment of physical function and screening for frailty, should be incorporated in the routine primary care for older people with diabetes. (3A)
- 2 We recommend that the tools for physical function assessment and frailty screening should be clinically validated, easy to do, quick to perform and do not require professional staff involvement. (3A)
- 3 We suggest that health care professionals should be educated about the impact of diabetes on a patient's functional status and the importance of regular screening for physical dysfunction and frailty. (1A)
- 4 We recommend that patients with physical dysfunction or identified as pre-frail or frail should receive further medical assessment and appropriate interventions. (3A)

Rationale and evidence base

Comprehensive physical functional evaluation comprises assessment of mobility, performance in activities of daily living (ADL), review of skills needed for independent life style and screening for frailty. Barthel Index is a simple tool that can measure the performance in basic ADL such as mobility and the instrumental ADL can provide further information about other functions such as managing medications.¹ The Timed Up and Go Test (TUGT) is another good screening tool that combines a physical function component of getting up and walking and, in addition, a cognitive component of being able to understand and execute commands.² Upper extremity muscle power can be tested by a hand grip strength using a dynamometer while lower extremity muscle power can be tested by either the 4-metre gait speed or the short physical performance battery (SPPB) which also predicts the risk of disability.³ Frailty can be screened for by using Fried Criteria which identifies robust, pre-frail and frail individuals.⁴ The Clinical frailty scale (CFS) is a 9-point scale that describes patient' functional characteristics and predicts mortality. The Electronic Frailty Index (eFI) is a larger

scale that uses the cumulative deficit model to identify and score frailty based on routine interactions of patients with their general practitioner and has been incorporated into the general practice databases. The value of this index is that it can be used to screen for the whole practice population who are >65 years old.⁵ Alternatively, frailty can be screened for by the FRAIL scale which is a well validated and has similar sensitivity and specificity as the Fried scale.⁶ It asks only 5 questions which cover fatigue, climbing stairs, walking, number of illnesses and weight loss. The PRISMA Questionnaire is a 7-item questionnaire to identify frailty and is suitable for postal completion. A score of >3 identifies frailty.⁷ The Multidimensional prognostic Index (MPI) covers 8 domains (disability in ADL, disability in IADL, number of medications, nutritional aspects, social aspects, risk of pressure sores, cognition, comorbidities) and it's accurate in predicting negative outcomes, including mortality). Few shorter versions have been validated, including self-administered and telephone-MPI.⁸

A table of frailty detection procedures is available in Appendix 1.

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Treatment Recommendations

Managing cardiovascular risk

Recommendations

- 1 In older people with diabetes, general lifestyle and management recommendations apply: smoking cessation, heart healthy diet and increased physical activity; hypertension and dyslipidemia must be treated with individualized goals and preventive purposes. (4A)
- 2 Benefit of weight reduction should be discussed according to the patient's needs and if necessary combined diet and physical activity program with resistance training should be used to reduce the risk of sarcopenia. (3A)
- 3 Patients should be trained to identify an irregular pulse, and annual ECG can be recommended for people with diabetes because of increased risk of atrial fibrillation. In case of no contra-indications, direct-acting anticoagulants should be preferred to warfarin. (4A)
- 4 SGLT2 inhibitors or GLP-1 agonist prescriptions should be considered in the older patient at risk, however this should be with caution due to the low level of clinical experience in subjects older than 80 years. (3A)

Rationale and evidence base

Practically all people with diabetes and over 60 years of age have high risk of cardiovascular diseases (CVD),¹ and use of risk charts is not necessary for assessment. CVD risk sharply increases if the patient has signs of renal dysfunction or heart failure. Consequently, total CVD risk needs to be treated with combined lifestyle modifications and drug treatments. Especially important for total risk are classical CVD risk factors (smoking, dyslipidemia, hypertension and obesity, as well as atrial fibrillation predisposing to embolic stroke).

Prevalence of smoking decreases with age, but cessation is beneficial at any age. A Heart-healthy diet, including controlled salt and alcohol consumption and incentives for physical activity, also apply to older people with diabetes.

Obesity is an established risk factor for diabetes and CVD among younger and middle-aged people. Gaining weight after midlife appears less harmful for mortality, but may nevertheless impair quality of life.² In observational studies mechanisms of weight loss – especially due to frailty – are usually not taken into account.^{2,3} There is scarce research of weight reduction (and effect on diabetes) among older people, and if it is considered necessary, development of sarcopenia and osteoporosis

should be avoided. Combining physical activity with dietary intervention is essential.³ There are no randomized trials of obesity surgery among older people 75 years or older. Because obesity predisposes to other CVD risk factors their identification and treatment is important.

Atrial fibrillation may have little symptoms among older people, and its identification is important to avoid embolic complications such as stroke. Because of associations with other risk factors, diabetes and atrial fibrillation frequently coexist. Both chronic and paroxysmal atrial fibrillation usually require anticoagulant (not aspirin) therapy also in old age.

Aspirin is indicated in secondary prevention of CVD (including those with diabetes) particularly if anticoagulants are not in use. Aspirin is no longer routinely recommended for primary prevention in diabetes.⁴

Decreasing CVD risk by anti-hyperglycemic drugs has been controversial.¹ The situation has radically changed after outcome trials with sodium-glucose cotransporter 2 (SGLT2) inhibitors and glucagon-like peptide-1 (GLP-1) agonists.⁵ Both drugs have been shown to reduce the incidence of major adverse CVD events. Because they have multiple beneficial effects in the cardiovascular system, benefits for CVD events are probably not due to anti-hyperglycemic actions of these agents. In diabetic kidney disease SGLT2 inhibitors may now be considered as first-line treatment.⁶ Although generally suitable also for older adults, SGLT2-inhibitors have properties (volume depletion, risk of genital infections) which warrant careful monitoring among the frailest older patients.

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Glucose regulation with oral and non-insulin injectable agents

Recommendations

- 1 In the absence of significant cardiovascular disease and/or chronic renal disease, we recommend metformin as a first line therapy in older people with diabetes due to its low risk of hypoglycaemia and cardiovascular safety. (3A)
- 2 We suggest a cautious use of sulfonylureas and glinides if the risk of hypoglycaemia is low. (2A)
- 3 We suggest the cautious use of pioglitazone but it is best avoided in patients with heart failure and volume overload. (3A).
- 4 We recommend the use of dipeptidyl peptidase-4 (DPP-4) inhibitors particularly in subjects with frailty due to their low risk of hypoglycaemia and a reasonable side-effect safety profile. (3A)
- 5 We recommend the use of the sodium glucose co-transporter-2 (SGLT-2) inhibitors and glucagon like peptide-1 receptor agonists (GLP-1RA) due to their lower risk of hypoglycaemia and cardiovascular benefit as part of an escalation in therapy. SGLT-2 inhibitors also have additional renal benefits. These agents are best avoided in frail older people who may have significant weight loss and anorexia. (4A)
- 6 We recommend regular monitoring of renal function during metformin, SGLT-2 and GLP-1RA therapy to avoid the risk of acute kidney injury and dehydration. (3A)

Rationale and evidence base

Glucose regulation is part of the holistic control of the metabolic disorder of diabetes mellitus, that involves the use of anti-hyperglycaemic agents which provide cardiovascular (CV) safety and protection. Hypoglycaemia is a recognized high impact complication of treatment particularly with insulin and sulphonylurea therapy. Older people with diabetes often have multiple risk factors for low blood sugar states developing during treatment and these include chronic renal disease, erratic eating meal patterns, dementia, polypharmacy, and even frailty. Metformin is a suitable first line therapy due to its low risk of hypoglycaemia and CV benefits. A meta-analysis has shown that metformin was associated with lower long-term (≥ 2 years) CV mortality compared with sulphonylurea {hazard ratio (HR) 0.6-0.7 and 0.6-0.9 from randomised controlled trials (RCT) and observational studies respectively}.¹ Metformin reduction of CV events has also been demonstrated in patients with chronic comorbidities.² In a U.S. population of older adults hospitalized for heart failure with comorbid diabetes, metformin initiation was independently associated with substantial improvements in 12-month clinical outcomes, driven by findings among patients with an ejection

fraction(EF) >40%. In contrast, sulfonylurea initiation was associated with excess risk of death and heart failure hospitalization, regardless of EF.³

The alpha glucosidase inhibitor, acarbose, can cause diarrhoea, and may have some CV benefits and low hypoglycaemia risk.⁴ The thiazolidinedione, pioglitazone reduces the risk of major CV events but increases the risk of heart failure and peripheral oedema, but may not be licensed for use in some countries.⁵ Dipeptidyl peptidase-4 (DPP-4) inhibitors are attractive due to their low risk of hypoglycaemia. A meta-analysis of DPP-4 inhibitors trials has shown CV safety but non-significant increase in heart failure, especially with saxagliptin.^{6,5} DPP-4 inhibitors also produce less severe hypoglycaemia in older frail individuals compared with sulphonyureas and may be preferred therapy.⁷

The newer agents of SGLT-2 inhibitors and GLP-1RA have demonstrated a consistent and a significant cardio-renal protective effect.⁸ They have a novel mechanism of action with low risk of hypoglycaemia. The efficacy and safety of these newer agents appear to include older people (≥65 years of age) who represented almost 50% of the participants in these trials. In a recent systematic review and meta-analysis of the newer agents in older people with diabetes, GLP-1RAs reduced major adverse cardiovascular events (MACE) whilst SGLT-2 inhibitors reduced MACE as well as heart failure and adverse renal outcomes.⁹

However, there is a need to monitor renal function during such therapy to reduce the risk of acute kidney injury or dehydration. Also, due to significant weight loss, these agents will not be suitable for very frail older people with significant weight loss and anorexia.

The figure 1 indicates key steps of anti-diabetic therapy in older patients.

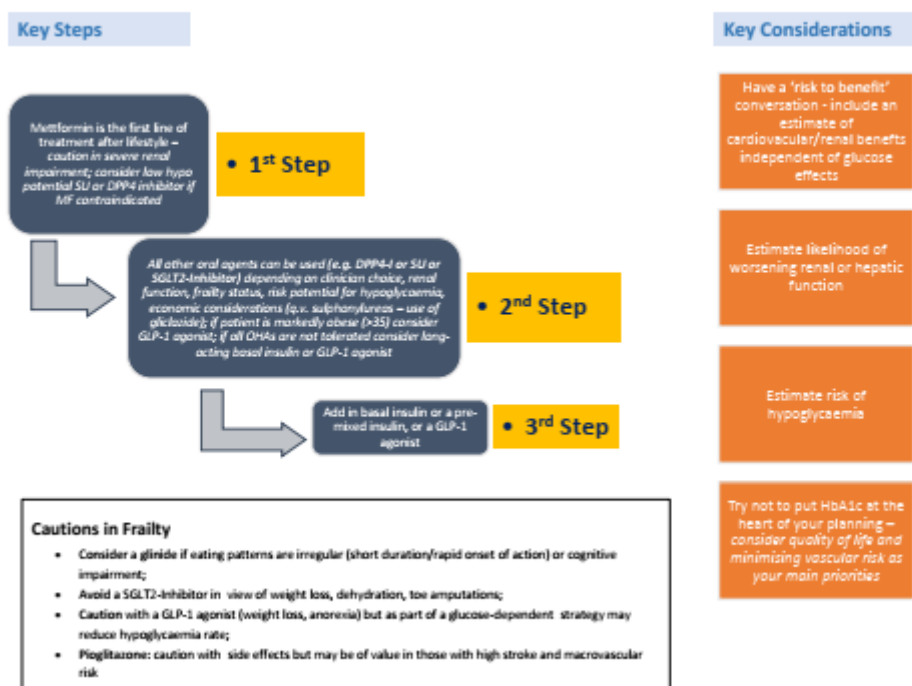


Figure 1 Decision-making steps to guide the choice of antidiabetic therapies in the older patient.

DPP-4=Dipeptidyl peptidase, SGLT=Sodium glucose cotransporter, GLP=Glucagon like peptide, GI=Gastrointestinal.

Table 3: Individualised glucose-lowering approaches		
Agent	Benefits	Cautions
Non-insulin therapy		
Metformin	First line use but at lowest dose possible to achieve maximum benefit.	Avoid in those with significant cardiovascular disease, chronic renal disease, weight loss and acute illness.
DPP-4 inhibitors	First (if metformin contraindicated) or second line if HbA1c still >58mmol/mol. Low risk of hypoglycaemia.	Gastrointestinal (GI) side effects, dose adjustment needed in chronic kidney disease.
SGLT-2 inhibitors	Suitable second line especially in obese or heart failure patients. Offers cardio-renal protection independent of glucose lowering effect. Low risk of hypoglycaemia.	Not suitable for moderately - severe frailty or care home residents with weight loss. Increases risk of urinary tract infections, candidiasis, dehydration and hypotension. Poor hypoglycaemic effect if eGFR < 60 ml / min. Possible episodes of diabetic ketoacidosis.
GLP-1 RA	Offers cardio-renal protection independent of glucose lowering effect. Low risk of hypoglycaemia. Suitable for obese patients.	Not suitable for those with chronic renal impairment or care home residents with weight loss or renal impairment. GI side effects.
Repaglinide	Can be used in end-stage renal insufficiency Can be used in combination with metformin if metformin alone is inadequate Efficient glucose lowering effect	Extended half-life in older people and in cases of renal insufficiency Medium hypoglycaemia risk Little data in older people.
Sulfonylureas	Low cost. Efficient glucose lowering effect.	High hypoglycaemia risk. High rate of interactions with other drugs. Possible cardiovascular side-effects with excess mortality. Avoid in severe renal impairment.
Acarbose	Low cost. Low risk of hypoglycaemia.	GI side effects. Limited glucose-lowering effects.
Insulin therapy		
Once daily long-acting basal insulin	Simple, once daily, easy titration, flexible administration, less weight gain and low risk of hypoglycaemia.	Less physiologic with postprandial glucose excursions. Various long-acting basal insulins are available
Twice daily combination or premixed insulins	Simple, fixed doses, good glycaemic control.	Weight gain, hypoglycaemic risk, suitable only for patients with regular eating patterns.
Basal-bolus insulin	Most physiological in its effects on glucose levels, good glycaemic control.	Complex titration, frequent injections, high risk of weight gain and hypoglycaemia. Obligation to adjust a priori and not post-dose Requires staff training in care homes.
Insulin-GLP-1 RA combination	Low risk of hypoglycaemia, delay the use of other complex insulin regimens.	GI side effects, GLP-1RA dose adjustments in chronic kidney disease. Same restrictions than GLP-1 alone

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Insulin therapy

Recommendations

- 1 Switching to treatment with insulin is suggested in
 - a. failure of oral treatment to control diabetes.
 - b. relative contra-indications to oral treatment (e.g. renal insufficiency).
 - c. in order to reduce adverse events from treatment including polypharmacotherapy. (1A)

- 2 We suggest the use of insulin in case of involuntary weight loss under oral antidiabetic therapy. (1A)
- 3 Insulin can be efficiently and safely used in combination with other agents such as metformin, DPP-4 inhibitors or SGLT-2- inhibitors. (3A)
- 4 We suggest the cautious use of long-acting basal insulin given once daily in the morning where there are stable meal patterns and little evidence of frailty. (1A)
- 5 We suggest the use of twice daily combination or pre-mixed insulin where a once daily insulin regimen fails to achieve targets. (2A)
- 6 In the long term, addition of short-acting insulin at one or more meal times, as part of a basal-bolus approach may be necessary to achieve blood glucose control. (3A)
- 7 We suggest the cautious use of insulin-GLP-1 RA combinations to avoid having complex insulin regimens. (2A)
- 8 Testing of cognition, visual acuity and fine motor skills is recommended in older persons who self-inject insulin. (3A)
- 9 An Individualized insulin dosage protocol must be provided to each older patient. (3A)
- 10 Appropriate staff training must be organized to improve insulin dosage administration in those who require assistance or who are dependent such as those who are housebound or resident in a care home. (3A)

Rationale and evidence base

Insulin therapy is required when oral antidiabetics fail to reach the defined blood glucose goals or are contraindicated. In hospitalized older inpatients, insulin is frequently used because of the high rate of contra-indication of oral treatment, malnutrition, renal insufficiency, low dietary intake or palliative care.¹ Sometimes insulin is administered in order to stop unwanted weight loss, but it fails to induce muscle anabolism in vivo.² Special attention should be given to persons with type 1 diabetes who are of advanced age. These patients should be clearly differentiated from those with type 2 diabetes and specific individualized care should be given.

In emergency departments from USA, the adverse drug event rate due to insulin in subjects older than 65y was estimated between 10.3 and 15.8 %.³

An analysis of pooled studies showed that in young old subjects (< 80y old) a better reduction of HbA1c with less hypoglycaemia with bed-time glargine versus NPH insulin in add-on to oral treatment.⁴ Insulin glargine 300U/ml or degludec-100 may induce less nocturnal hypoglycaemia than glargine at 100U/ml. No significant difference was found in blood glucose control or in hypoglycemia risk between degludec-100 and glargine-300,⁵ both with longer action duration than glargine-100. In a non-inferiority RCT in older patients (20.9% > 75 years old) glargine-100 and -300 U/ml had similar efficacy and hypoglycaemia incidence.⁶ In older patients (>65yr and < 80yr) premix 75/25 lispro was more efficient than glargine-100 in maintaining blood glucose control in the long term.⁷

In these studies people older than 80 y, frail or dependent or cognitively impaired or those with low dietary intake were not represented. Furthermore, only one study⁶ provides a subgroup analysis in subjects older than 75 years. Frail, sarcopaenic older persons have a high risk of unattended hypoglycaemia, particularly in long term care. Special training programmes for staff help to reduce their occurrence.⁸ In older people with type 2 diabetes there appear to be advantages of longer acting insulin analogues in comparison with NPH insulin in reducing emergency room visits or hospitalization rates.⁹ However, data from DPV (Diabetes-Patienten-Verlaufsdokumentation) and DIVE (Diabetes Versorgungs-Evaluation) registries suggests that there may be little differences between the various long acting insulin types (including analogue and NPH insulins) in the rates of severe hypoglycaemia in those individuals aged 75 years and over.¹⁰

Basa-bolus insulin regimens may be safely used after using a personalized protocol for insulin dosage determination,¹¹ as long as cognitive and manual functions are sufficient.¹² A RCT in a long-term care unit showed that basal bolus therapy was more efficient in decreasing blood glucose than sliding scale insulin injections but with a similar rate of adverse event including hypoglycaemia.¹³ In older patients with either hypoglycaemia or uncontrolled hyperglycaemia, use of an algorithm for insulin treatment simplification including insulin glargine injection in the morning, was shown to be efficient and decreased the rate of hypo/hyper-glycaemia.¹⁴ In this later observational study one patient in four had cognitive impairment.

The use of sliding scale protocols was shown to be associated with poor outcomes but is commonly used in nursing homes.¹⁵ Sliding scale protocols consist in assessing the need for insulin administration based solely on current blood glucose levels. A staff training programme can improve practices in resident insulin dosage protocols.¹⁵

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Hypoglycaemia Avoidance

Recommendations

- 1 We suggest that all health professionals involved in the care of older patients with type 2 diabetes should assess the risk of hypoglycaemia and adjust glycaemic targets to levels appropriate to the functional capacity, comorbid load, frailty level and life-expectancy of the individual. (2A)
- 2 We recommend that all older people should have regular medicines reviews to assess potential hypoglycaemic risks. This should include: minimising exposure to sulphonylureas (particularly long-acting agents; using low risk insulin regimens such as once daily NPH or long-acting analogue; and reducing polypharmacy. (3A)
- 3 We recommend that all insulin treated patients should be assessed for capacity to self-administer, where this is not possible third-party administration should be considered. It is important to ensure good education support for both patients and carers in respect of injection timing and blood glucose monitoring. (3A)
- 4 We suggest that all patients at high risk (low glycated haemoglobin or frailty) or those that experience either frequent or severe hypoglycaemia should be subject to a multidisciplinary review to reduce exposure to hypoglycaemic agents and to assess cognitive capacity in respect of medicines safety. (2A)
- 5 We suggest that extra vigilance of hypoglycaemia is required in patients with type 1 diabetes of older age, as they may become hypoglycaemia unaware and their physiological response is blunted. This may require changes in glucose targets, correction factors, insulin dose and mode of delivery. In severe cases glucose sensors may be indicated. (2A)
- 6 We suggest that systematic approaches to identify older people at risk of hypoglycaemia should be considered, and where possible, integrated with the monitoring of severe hypoglycaemic events in the local population (ambulance call outs, emergency department attendance or hospital admission). Such events should be investigated, and compensatory strategies implemented to prevent further occurrences and to inform systemic learning on how to minimise such events in the care system generally. (1A)

Rationale and evidence base

Older people with diabetes can be at greater risk of hypoglycaemia compared with the younger population, as awareness and counter-regulatory response can be blunted.¹ The risks conveyed by hypoglycaemia in this population are amplified and include: cardiovascular events; falls and fractures; and there may be a relationship between hypoglycaemia and cognitive function, neurological decline and psychomotor functioning.^{2,3} Risk factors for hypoglycaemia in older people include: frailty; cognitive impairment; comorbidities, particularly renal disease; exposure to sulfonylureas, particularly long-acting agents; insulin exposed patients, particularly twice daily mixed insulin and basal bolus regimens; a low glycated haemoglobin; and low body mass.²⁻⁴ Older people may experience low level hypoglycaemia with detrimental effects without realising, contributing to under detection of hypoglycaemia in the older population.⁵ This problem may be exacerbated if the older person loses the capacity to reliably test their blood-glucose themselves. Hence it is important to consider that adequate testing is instigated and in the case of more pronounced hypoglycaemia unawareness particularly in older people with Type 1 diabetes continuous glucose monitoring (with alarms) may be required. It is important to remember that the avoiding severe hypoglycaemic episodes in older people is extremely important. The risk of severe hypoglycaemia in older people with Type 1 diabetes is elevated as their physiological response to a falling glucose level and hypoglycaemia awareness is diminished.⁶ It is imperative to ensure that a regular review of medicines is undertaken to assess potential hypoglycaemic risks.⁷ Hence, glucose targets need to be conservative and individualised. It is important to follow a person-centred approach in agreeing changes to diabetes therapies or self-management practices as this may mean significant adjustments to established behaviours and personal beliefs about their diabetes. Such discussion may also need to include family members and carers where there are deficits in an individual's physical or mental capacity

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Deprescribing and De-escalation of Glucose-lowering Therapy

Recommendations

- 1 We suggest that deprescribing antidiabetic drugs should be considered if the patient's glycated hemoglobin level falls below 6.5% (48 mmol/mol), or below 7.0% (53 mmol/mol) in the presence of frailty. (1A)
- 2 We suggest that older adults with type 2 diabetes who have dementia, moderate to severe frailty, significant renal impairment, high levels of multimorbidity, etc (see Box 2) may particularly benefit from a de-prescribing policy. (1A)
- 3 We suggest that older adults with type 2 diabetes and frequent hypoglycaemia on complex insulin regimens should be reviewed for consideration of de-prescribing. (2A)

Rationale and evidence base

We still know very little about the process of medication de-prescribing (de-escalation or deintensification) and its relationship to outcome. Up to now, there have been no clinical guidelines that clearly advise when to deintensify hypoglycaemic medications or describe patients' characteristics for whom deintensification is appropriate.¹

There is a need to change our clinical practice to reflect the dynamic nature of the multimorbid condition of older people with diabetes. Clinical practice should view prescribing and deprescribing as two sides of the same coin. Therefore, targets should not only be individualised but also dynamic and flexible adapting to the changes in the general condition of the patient. Increasing awareness of the health care professionals and the public through education and updating the clinical guidelines is required.¹

Deprescribing unnecessary drugs in geriatric patients is a strategy that aims to improve quality of care while reducing costs.² Unfortunately, there is no clear indication as to when and how to deprescribe drugs. Several studies in long term care and in outpatient clinics showed a reduced risk of hypoglycemia, without HbA1c increasing above appropriate targets, when drugs were stopped or substantially reduced in patients with good glucose control.³ However, currently few older patients with reduced HbA1c undergo deprescription, unless they report drug-related adverse effects¹ or hypoglycemia.⁴

A recent review¹ examined safety concerns of de-prescribing hypoglycaemic medications in older people with type 2 diabetes. It emphasized the importance of the need for guidelines that clarify when to deintensify medications and balance the performance measures that incentivize both appropriate intensification and appropriate deintensification. In Box 2, we have reproduced a table that uses the acronym: 'deintensify' to describe number of patient characteristics which will alert the clinician to consider de-prescribing:

Box 2: Summary of patients' characteristics to DEINTENSIFY hypoglycaemic medications in older people with type 2 diabetes¹

- **Dementia**, especially those with erratic eating pattern and abnormal behaviour.
- **Elderly**, especially those ≥ 80 years old.
- **Impaired renal function**, especially those with end stage renal disease.
- **Numerous comorbidities**, especially those with ≥ 5 comorbidities.
- **Tight glycaemic control**, especially those with HbA1c $< 7\%$.
- **End of life phase**, especially those with \leq one year life expectancy.
- **Nursing home residents**, especially those with multiple comorbidities.
- **Significant weight loss**, especially unintentional indicating frailty.
- **Inappropriate medications**, especially insulin or sulfonylureas.
- **Frequent hypoglycaemia**, especially serious episodes needing assistance.
- **Years long of diabetes**, especially those > 20 years duration.

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Blood pressure regulation

Recommendations

- 1 Physical activity and sensible control of weight (avoiding malnutrition and sarcopaenia) must be promoted in older patients with diabetes to prevent or manage hypertension. (3A)
- 2 We suggest that all patients should be informed of the benefits of reducing salt and alcohol consumption. (1A)
- 3 In older patients with diabetes the global strategy of anti-hypertensive treatment is similar to that in patients without diabetes. (4A)
- 4 Community-living, older hypertensive patients, with diabetes, who are functionally independent, and in a stable condition can be treated according to current international recommendations for non-diabetic people older than 65 years. (4A)
- 5 The goal for treatment in well-functioning older people with diabetes may be as low as SBP < 120mmHg but in moderately frail subjects a benefit can be achieved with higher SBP goals (up to 150mmHg) (4A)
- 6 We suggest that in very frail older people with diabetes, treatment decisions must be individualized and based on comprehensive geriatric assessment. (1A)
- 7 First line drugs are ACE inhibitors/ ARBs, calcium blockers or diuretics. Beta-blockers are second-line drugs and indicated when the patient has coronary disease, heart failure or permanent atrial fibrillation (4A)

Rationale and evidence base

Hypertension is an important cardiovascular disease (CVD) risk factor throughout life.¹ Although lifestyle changes may have limited effects on blood pressure in older adults, in those with diabetes, the benefits of reducing salt and alcohol consumption may be advantageous. Promoting physical activity and sensible control of body weight (avoiding malnutrition and sarcopaenia) is also important. Several trials have demonstrated the benefits of drug treatment of hypertension to reduce the risks of CVD events and mortality in older people.¹ In addition, the incidence of mild cognitive impairment or clinical dementia have been reduced in antihypertensive drug trials.^{2,2}

Benefits for older people with diabetes have been largely inferred from trials in unselected middle-aged or older people, or trial subgroups of older people with diabetes. In the randomized and placebo-controlled trial (HYVET³) antihypertensive drug treatment started at age over 80 years in relatively well-functioning individuals without orthostatic hypotension reduced total mortality and heart failure. HYVET included 7% of participants with diabetes and systolic blood pressure (SBP) goal < 150 mmHg). In the SPRINT trial (no patients with type 2 diabetes) comparing SBP treatment targets < 140 and <120 mmHg, more intensive blood pressure target was associated with CVD and mortality benefits, also among participants aged 75 years and older.⁴

An earlier similar trial in participants with diabetes (ACCORD-BP) did not show a benefit on the primary outcome (major CVD events) between SBP targets < 120 and <140 mmHg,⁵ However, a significant reduction in stroke (secondary outcome) was observed in the more intensively treated group. Of note, in ACCORD more intensive blood pressure lowering was associated with reduced CVD events in the treatment arm receiving standard glucose treatment.⁶

The benefits in HYVET and SPRINT trials were independent of the degree of frailty in their participant populations. However, neither trials included very frail older people, and for them treatment and treatment goals must be assessed individually in order to adjust for their enormous heterogeneity.⁷

Generally, selection of antihypertensive therapy for older patients is similar to those among younger patients.¹ For patients with diabetes ACE inhibitor or ARB therapy is usually indicated combined if necessary with a calcium-channel blocker and/or small dose of a diuretic. Beta-blockers are not first line drugs, but are indicated for concomitant coronary heart disease or heart failure, or as second-line therapy.¹

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Plasma lipid regulation

Recommendations

- 1 In subjects with no history of cardiovascular disease, a statin should be offered to patients with an abnormal lipid profile (high LDL and/or abnormal HDL) when their life-expectancy (determined by their functional status) is over 5 years. (2A)
- 2 In subjects with no history of cardiovascular disease but a life-expectancy lower than 5 years (very frail patients or very old patients, >84 years), we suggest that lipid-lowering therapy should only be considered under specialist advice because of the relative lack of benefit in those with diabetes after age 84 years. (2A)
- 3 A statin should be offered to patients with an abnormal lipid profile who have proven cardiovascular disease. (4A)
- 4 Consider statin therapy in older subjects with diabetes to reduce the risk of ischaemic heart disease and stroke as part of secondary prevention of cardiovascular disease. (3A)

5 A fibrate should be considered in patients with an abnormal lipid profile who have been treated with a statin for at least 6 months but in whom the triglyceride level remains elevated (≥ 2.3 mmol/l). (2A)

Rationale and evidence base

The role of lipids for the primary prevention of atherosclerotic disease in older population (over 70 years) has been controversial¹ since findings from previous studies suggested that elevated LDL cholesterol levels were not associated with increased risk for myocardial infarction (usually equivalent to atherosclerotic disease in the large epidemiological studies). For example, the Prospective Studies Collaboration meta-analyses (61 prospective cohort studies)² showed that higher total cholesterol was associated with greater mortality from ischaemic heart disease, ranging from 55% in people younger than 50 years to only 15% in people older than 80 years. In other studies, the association between elevated cholesterol and risk of ischaemic heart disease even disappeared in individuals older than 70 years. Add to this, the lack of clinical trial evidence for statin efficacy in individuals older than 75 years, led to the fact that most of the primary prevention guidelines (with the only exception of UK National Institute of Health and Care Excellence guidelines) do not provide strong recommendations on statin use for older people. This is not different for older people with DM.³

However, recently published observational studies, including more contemporary populations aged 70-100 years, in high-income countries where life expectancy is more than 80 years, with a background of Caucasian ethnicity, have shown that elevated LDL cholesterol is associated with increased risk of myocardial infarction and atherosclerotic cardiovascular disease in individuals aged 70–100 years.⁴

These late studies support our recommendation of individualizing abnormal lipid profile (high LDL cholesterol, normal HDL) treatment with statins for individuals older than 75 years with life expectancy over 5 years. Life expectancy is determined by functional status (see other recommendations about functional assessment) and low total cholesterol a poor outcomes predictor.⁵

In relation to secondary prevention of cardiovascular events in older people with DM, there is a strong evidence to recommend treatment with statins when there is an abnormal lipid profile with the addition of fibrates when triglyceride levels remains elevated after at least 6 months of treatment with statins.²

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Digital Health and Diabetes Care

Recommendations:

- 1 To enhance the quality of community diabetes care delivered to older people, we suggest that all stakeholders including primary care use the full range of digital communication tools, shared health care records, and digital diagnostic equipment available to them with the key purposes of maintaining functional status, reducing unnecessary hospital admissions, and meeting agreed glycaemic targets 1A
- 2 We suggest that all able older people with diabetes receive education and instruction to use a diabetes-management app on a mobile phone, tablet, or computer to support their personalised diabetes care plan 1A
- 3 We suggest that a diabetes management app for older people should include the following elements of care and intervention: glucose levels, oximetry, nutritional plan, exercise plan, blood pressure record, hypoglycaemia alert messages, help with insulin dosages, contact telephone and SMS text messaging to GP practice and community nurses, sick day rules. 1A
- 4 Tele-medicine consultations should be proposed for older people with limited access to medical care to improve diabetes control without an undue increased risk of hypoglycaemia 3A

Rationale and Evidence Base

New technologies have found several applications in the field of diabetes care and prevention. Telemedicine including remote expertise, tele-consulting and remote monitoring is commonly used in diabetes care, accelerated by the Covid pandemic.

Overall, the use of telemedicine was shown efficient to improve quality of diabetes care in the adult population, particularly in blood glucose control.¹ However, very few people older than 70 years old were included in the original papers. Distance screening for retinopathy has been available for more than 20 years and development for self-screening with a mobile phone also available. Testing and screening vans, close to people may be particularly adapted to subjects with impaired mobility or living far from medical centers. Oral health and cardiovascular complications can be checked with similar modalities. In care homes, tele-consultations may assist staff learning and education; this may lead to enhanced personalized care plans being developed.

The use of continuous glucose monitoring (CGM) in older subjects is associated with a decrease in mean HbA1c values and glycemic variability² and less severe hypoglycemic events.³ The advantages of CGM may be similar in subjects with cognitive problems who are helped by care-givers.⁴ Wireless transmission of testing based on CGM sensors can further improve the monitoring of diabetes particularly for those with increased hypoglycemia risk.

Insulin-dose selection systems are also promising based on personalized algorithm or artificial intelligence.

The use of smart-phone apps has been shown to be associated with a number of benefits such as HbA1c levels, body weight and physical activity levels but studies are limited by their small duration of interventions (< 1 year. Integrative personalised management of diabetes in older people may be facilitated using new technologies.⁵ A proposed care loop integrated 6 steps: systematic analysis, personalised treatment, treatment efficacy assessment, structured education, structured and adapted life style (food and exercise), and structured documentation. Following this, structured documentation is used for structured analysis. In comparison with usual care in insulin-treated patients, this integrative system was shown to be more efficient on decreasing HbA1c without an increase in hypoglycemia risk.⁶

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Complications

Management of acute illness including Covid-19

Recommendations

- 1 Older subjects with T2DM should be encouraged to receive Covid-19 immunization. (4A)
- 2 Blood glucose must be kept within agreed target ranges to decrease the risk of any infection or the risk of severe Covid-19 infection. (3A)
- 3 We suggest that the frequency of monitoring of blood glucose and blood pressure should be agreed and undertaken as a minimum twice daily (blood glucose) and daily (blood pressure). This should be maintained and reinforced during these periods. (2A)
- 4 With T2DM, we suggest that corticosteroid treatment needs close monitoring and frequent correction of blood glucose, Na and K, and the state of hydration must be monitored. (2A)
- 5 We suggest that care homes that manage sufficient residents with diabetes and have suitable medical equipment, should attempt to upskill with training and education to manage the

acute care of residents with covid-19 including corticosteroid and oxygen therapy as an alternative to hospitalization in selected cases. (1A)

Rationale and evidence base

The epidemiology of Covid-19 infection, severity of illness and mortality seem to be shifted towards older people particularly those with multiple comorbidities such as diabetes, hypertension, and cardiovascular disease.^{1,2} This will of course challenge the effective delivery of diabetes care within national diabetes services globally.³

The incidence of infections (bacterial, viral, fungal) is generally increased with type 2 diabetes mellitus (T2DM), particularly when blood glucose control is poor.⁴ The metabolic presentation of Covid-19 at diagnosis in T2DM may be increased hyperglycemia alone or with hyperosmolar dehydration, hypoglycaemia, or as diabetic ketoacidosis depending on its severity. In a similar way, during other infections, hyperglycaemia can decompensate due to fever and lack of water ingestion. Hypoglycaemia may occur due to infection-related anorexia decreasing carbohydrate intake.

Subjects with T2DM have increased risk of severe forms of Covid-19, particularly those with frailty.⁵ In a large population-based study in UK, mortality due to Covid 19 was increased with older age, in those with cardiovascular complications, hypertension, renal failure, and unfavorable socioeconomic profile. Furthermore there was a U-shape relationship between mortality and BMI (the lowest rate for BMI 25-29.9 kg/m²) or HbA1c (the lowest rate for HbA1c 48-58 mmol/mol).⁶ Evolution from Covid pneumonia to fibrosis was shown more frequently with diabetes.⁷ Acute renal failure during Covid 19 is also more frequent with T2DM.

Corticosteroids are now first line treatment for Covid pneumonia, which may induce hyperglycemic decompensation, hypertension, fluid overload and electrolyte disturbances in those with T2DM.

During lockdown periods, behavioural changes are possible leading to improved or deteriorated HbA1c. However, keeping up physical activity is an issue and home-based programmes should be proposed.

In the UK, national guidance has been produced for the management of diabetes and covid-19 in care homes.⁸ This emphasized the importance of providing community-based support to care home residents with diabetes, education care staff about management of acute illness in general and in those with covid-19, the importance of regular monitoring of glucose and ketones, and the need to have a proper policy in force which deals with hypoglycaemia.

More recently, international guidance on the management of dexamethasone and oxygen therapy in residents with diabetes and covid-19 in care homes has been published⁹ as a collaboration between

the European Geriatric Medicine Society (EuGMS) and the European Diabetes Working Party for Older People (EDWPOP). This provides the key objectives of these therapies and how care staff can be supported to manage residents in those facilities that have suitable medical equipment as well as skilled staff who are capable of managing steroid and oxygen therapy.

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Depressive illness and mood states

Recommendations

1 The assessment of depressive and anxiety symptoms in older people with diabetes can be performed on an annual basis using validated assessment tools such as the short form Geriatric Depression Score or the PHQ-9. (3A)

2 Pharmacological treatment of depression in older patients with diabetes should be tailored with consideration of the side effects of antidepressant medications on metabolic outcomes, such as weight gain. (3A)

3 In older patients with diabetes and depression, the use of antidepressants should be used taking into account any prevailing cardiovascular risk factors, particularly the presence of cardiac arrhythmias and conduction disorders. (4A)

4 We suggest that the specialist-prescribed use of anxiolytic medications in people with diabetes should be strictly monitored since these medications may increase blood glucose levels. (3A)

Rationale and Evidence base

Depression is a common condition in older people, probably affecting one person over five after 65 years.¹ Depression itself is associated with several negative outcomes in older persons, including cardiovascular disease² and mortality.³

Diabetes seems to be associated with a higher incidence of depression, particularly in older people. When compared to their counterparts, diabetic people have a greater incidence of depression of about 33%, as reported in a large meta-analysis regarding this topic.^{4,5}

Diabetes and depression seem to be associated through several pathways. First, they share the same risk factors, including obesity, sedentary behaviour, and poor economic status.⁶ Second, it is also possible that antidepressants may increase the risk of diabetes and that some oral anti-diabetic medications may increase the risk of depression.⁶ Finally, it has been hypothesized that depression and diabetes have common pathophysiological mechanisms such as inflammation, hypothalamic-Pituitary Adrenal (HPA) axis dysfunction and altered brain structure and function.⁶

The association between diabetes and anxiety, another common mood disorder is epidemiologically less clear. Diabetes increased the risk of anxiety in five observational studies including more than 12,000 participants, of about 25%.⁷

Modern therapies for managing depression in a setting of diabetes include pharmacological therapy, group therapy, psychotherapy and collaborative care and these may also be associated with improvements in glycaemic control.⁸

Assessment of depression in primary care settings can include a variety of assessment tools including the short form Geriatric Depression Scale⁹ or the PHQ-9.¹⁰

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Diabetes, Cognitive dysfunction and Dementia

Recommendations

- 1 We suggest that at the time of diagnosis and at regular intervals there after , patients aged 70 years and over should be screened for the presence of cognitive impairment using a structured approach (including use of age-, language-, culturally-validated screening tools such as the MoCA, MiniCog, MiniMental State Examination Score). (2A)
- 2 In older patients with established risk factors for cognitive impairment, a risk score can be applied to estimate the risk of cognitive impairment. (3A)
- 3 The detection of frailty and complex multimorbid profiles may help to identify older people with diabetes at greater risk of developing cognitive impairment. (3A)
- 4 Prevention of repeated hypoglycaemia in older patients with diabetes may decrease the risk of developing cognitive impairment or dementia. (2A)
- 5 A full medical assessment is required in older people with diabetes to exclude common reversible causes of cognitive impairment such as delirium, medication side-effects, metabolic or endocrine disturbances, sleep problems, and depressive disorder. (4A)
- 6 Optimal glucose and blood pressure regulation should be aimed for in older patients with diabetes to maintain cognitive performance and improve learning and memory. (3A)
- 7 We suggest that in order to maintain diabetes self-care ability, older subjects with diabetes should be screening at regular intervals for cognitive impairment. (2A)
- 8 For older people with diabetes who are suspected of having cognitive impairment, referral to a multidisciplinary specialist diagnostic and evaluation service is required. (4A)
- 9 Best practice guidelines are available for diabetes healthcare professionals caring for people with diabetes and cognitive impairment or dementia and these should guide current management (2A)
- 10 Several interventions including adapted self-management curricula, problem-solving and behavioural interventions may play a role in managing older adults with type 2 diabetes and cognitive impairment. (3A)

Rationale and evidence base

Type 2 diabetes and cognitive impairment appear to have reciprocal causation but are also highly prevalent disorders that may coexist in the same older adult irrespective of their pathophysiological interrelationships.¹⁻⁴ In older adults with diabetes, many of the diabetes-associated declines in cognitive performance may be subtle but can amount to modest changes in verbal and visual memory, attention and concentration, processing speed, executive function and motor control.^{1,2,5}

Good clinical practice requires screening for cognition level and at regular intervals afterwards in older adults with type 2 diabetes.^{1,6-8} Clinicians can take advantage of a risk score approach to

determining the likelihood of a subject with type 2 diabetes developing dementia.⁹⁻¹¹ The presence of frailty and high level comorbidity profiles appears to increase the risk of developing cognitive impairment.^{1,12-14} Preventing repeated hypoglycaemia may also reduce the future risk of developing cognitive problems.^{15,16} Causes of reversible cognitive impairment should be sought.^{1,17}

Clinicians should also aim to maintain optimal glucose and blood pressure regulation to preserve cognitive performance.¹⁸ Maintaining optimal self-care ability in diabetes processes, subjects with diabetes should be screened regularly for cognitive issues.^{1,6,19,20} Referral to a multidisciplinary specialist diagnostic and evaluation service should take place when there is suspected cognitive impairment.^{18,21,22}

To guide management, best practice guidance and part-evidence-based guidelines are available to clinicians.^{1,6,23-26} There are no current effective interventions to reverse or reduce the cognitive impairment in subjects with type 2 diabetes but several appear to demonstrate some benefits.²⁷⁻²⁹ However, a recent exploratory analysis of the REWIND trial in subjects aged > 50 years with type 2 diabetes and additional cardiovascular risk factors has demonstrated a reduction in cognitive impairment using dulaglutide (a GLP-1RA) during long term therapy prompting the importance of future research in this area.³⁰

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Vascular disease

Recommendations

- 1 Screening and effective treatment of CVD must be undertaken in older people with diabetes, including the use of drug treatment of CVD risk factors and revascularization procedures when indicated. (4A)
- 2 Prevention of stroke in diabetes includes comprehensive treatment of risk factors, hypertension, dyslipidemia and smoking, and anticoagulation in case of atrial fibrillation or antiplatelet drug in secondary prevention. *Please note: Routine antiplatelet therapy in diabetes without clinical vascular disease is not recommended.* (4A)

3 In older people with diabetes, diabetic kidney disease can progress rapidly, and renal function should be assessed annually. (4A)

4 ACE inhibitors/ARBs are indicated for prevention and treatment of diabetic kidney disease in older people with diabetes. (4A)

5 In view of favourable reno-protective effects, SGLT2-inhibitors should be used independently of their hypoglycaemic effect to prevent worsening of renal function. 4A

6 We recommend the examination of the feet of all patients with diabetes annually for the presence of peripheral artery disease (PAD), even in the absence of foot ulceration. At a minimum, this should include taking a relevant history and palpating foot pulses. (3A)

7 We recommend a multidisciplinary foot approach to diabetic foot disease for advanced lesion rescue. (4A)

Rationale and evidence base

Large and small vessel cardiovascular disease (CVD) and its major risk factors – dyslipidemia, hypertension, obesity and physical inactivity – are frequent companions of diabetes, both type 1 and type 2. CVD is the major cause of mortality and morbidity in people with diabetes, including in the oldest-old (>85 years).

Ischaemic heart disease and heart failure

Angina pectoris and myocardial infarction are classical presentations of atherosclerotic coronary artery disease, and myocardial infarction is a frequent cause of death in older patients with diabetes. Management of CVD risk factors is essential. Coronary revascularization gives symptomatic relief in macrovascular disease and improves prognosis in acute situations. Left ventricle injury is also the leading cause of heart failure with reduced ejection fraction (HFrEF, “systolic” HF). In older patients, however, an increasing problem is heart failure with preserved ejection fraction (HFpEF, “diastolic” HF), for which diabetes and hypertension are important risk factors.¹ Diabetes predisposes also to ischaemic heart disease due to small vessel dysfunction, which may cause symptoms similar to those of classical coronary artery disease.² This type of heart disease is more common among women. It cannot be treated with revascularization, and management of risk factors is an important goal of care. It is of note that ischaemic heart disease can also be clinically “silent” in older people with diabetes, and only discovered later from an ECG recording.

Cerebrovascular disease and stroke

Diabetes is one of the significant risk factors for all strokes, but ischaemic stroke is particularly related to diabetes. In studies the relative risk associated with diabetes varies from 1.8 to 6.0. Also impaired glucose tolerance and insulin resistance increase risk of stroke. Ischaemia can be due to atherosclerotic or embolic process. Atrial fibrillation is frequent in diabetes and increases relative risk of stroke several fold. Microangiopathy risk with periventricular and subcortical leucopathy that increase the risk of cognitive disorders and physical impairment is also more frequent with diabetes and hypertension.³

Diabetic kidney disease

Diabetic kidney disease is common. It is diagnosed either by reduced glomerular filtration rate (GFR, <60 ml/min) or presence of increased (>3 mg/mmol) albuminuria. The term diabetic nephropathy is confined to histologically verified cases. Both reduced GFR and increased albuminuria are associated with increased risk of CVD; a relatively new observation is that GFR may decrease independently of albuminuria, up to 40% of patients with diabetes may have only reduced GFR. It seems, though, that reduced GFR alone is not as harmful as albuminuria. Vascular dysfunction is an important background factor for diabetic kidney disease and effective treatment of hypertension and diabetes is essential. Of anti-hyperglycaemic agents, SGLT2-inhibitors have emerged to be important in diabetes-related kidney disease, with canagliflozin being shown to inhibit the progression of diabetic kidney disease.⁴ However, little is known about patients aged 80 years and older with diabetes due to their low representation in randomized controlled trials.

Peripheral artery disease (PAD)

People with diabetes have double the risk of PAD when compared with people without diabetes and the risk rises linearly with increasing blood glucose. In diabetes, PAD also deteriorates more rapidly, and risk of amputation is substantially increased. Recent international guidance⁵ summarises the evidence base in this area relating to prevention and treatment and this includes efficient control of CVD risk factors and revascularization in severe cases.

Diabetic foot disease

Diabetic foot disease is a multifactorial and complex syndrome. An important background is ischaemia due to both macrovascular and microvascular dysfunction. Diabetic neuropathy predisposes to injuries and diminished pain sensitivity contributes skin problems such as ulcers. Wounds heal poorly because of vascular dysfunction and hyperglycaemia further predisposes to

infections. Diabetic foot disease increases risk of amputation several-fold with consequent disability. Diabetic foot disease is associated with an increased risk of falling. Besides control of risk factors and improving blood circulation, regular inspection of feet and skin is very important. Older patients with diabetes are especially vulnerable because eye problems and cognitive impairment may lead to poorer self-inspection of foot problems. Recent international guidelines on the basic principles of prevention, classification, and treatment of diabetic foot disease⁶ provide practical guidance and a review of the evidence base in this area.

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Visual Loss

Recommendations

- 1 We recommend that older people should have a full ophthalmological examination which includes visual acuity and retinal photography on the initial diagnosis of diabetes and annually thereafter. (3A)
- 2 We recommend that patients and health care professionals should be educated about the ophthalmological complications of diabetes in older people and the importance of timely screening and early treatment. (3A)

3 We recommend control of metabolic risk factors such as hyperglycaemia, hypertension and dyslipidaemia that may help reduce the risk of diabetic retinopathy. (3A)

4 We suggest the use of mobile optometric service or digital tele-retinal imaging for care homes residents or less mobile older people. (1A)

Rationale and evidence base

Diabetes is a common cause of potentially preventable visual loss. Common causes of visual loss in older people with diabetes are age-related macular degeneration (ARMD), cataract, glaucoma and diabetic retinopathy (DR). While cataract occurs at an earlier age in persons with compared to those without diabetes, the risk of ARMD or glaucoma is not increased by diabetes.¹ DR is a diabetes-related microvascular complication that affects up to one third of patients with diabetes and can lead to visual loss if left untreated.² Many of patients with diabetes are unaware that they have DR or received an eye examination with pupil dilatation. Therefore, a complete ophthalmological examination should be performed on the initial diagnosis of diabetes as DR may be present in up to 15% of patients newly diagnosed with diabetes after the age of 70 years.¹ Thereafter, eye examination should be done annually and should include visual acuity, pupil dilation and retinal imaging.^{1,3} Fundus photography with dilated pupil helps diagnose DR as well as other diseases such as ARMD or glaucoma.¹ As many older people with diabetes may not be able to seek eye examination due to disability or have less access to eye screening clinics, using a mobile optometric service or digital tele-retinal imaging is a possible solution to increase screening compliance especially for care home residents.⁴ Timely diagnosis and treatment of DR can prevent visual loss.⁵ Also control of metabolic risk factors such as hyperglycaemia, hypertension and dyslipidaemia may help reduce the risk of DR.² Diabetic eye disease can significantly interfere with individuals ability to conduct activities of daily living such as walking, shopping, preparing meals and socialising therefore, maintaining visual health in older people with diabetes may help maintain their independence.⁶

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Women's sexual health and erectile dysfunction

Recommendations

- 1 We suggest that older persons with diabetes should benefit from sexual dysfunction screening with the use of questionnaires assessment using the International Inventory of Erectile Function in men and Female Sexual Function Index in women. (1A)
- 2 We suggest that sexual dysfunction should be managed using an integrated approach with respect to the willingness and cooperation of the older person with diabetes. (1A)
- 3 Older men with diabetes with ED should be offered a treatment with an oral phosphodiesterase-5 inhibitor. In case of insufficient response a vacuum erection device should be proposed. (4A)

Rationale and evidence base

Sexual dysfunction in both genders is an important complication of diabetes. In older patient it may be overlooked and participation of men or women older than 80 years in any study is limited. Each component of the indices of women sexual dysfunction (WSD) is concerned including desire, subjective arousal, lubrication, orgasm, satisfaction, and pain. In post-menopause women, sexual dysfunction is worsened due to the addition of genitourinary syndrome. About one in two men with T2D older than 65y complains of erectile dysfunction (ED) when asked; the proportion increases in those with poor metabolic control, long diabetes duration, complications, and with smoking.¹

Diabetes increases the likelihood of sexual dysfunction through multiple mechanisms, vascular (atheroma and endothelial dysfunction), neurogenic (central or peripheral), and metabolic. Obesity, overweight, metabolic syndrome, hypertension and hyperlipidemia frequent with T2D, increased SD risk.²⁻⁴ Finally, medications used in patients with T2DM increase the risk of WSD and ED: beta-blockers, calcium-blockers, thiazide, and anti-depressants.³

Screening should be done with a validated questionnaire: International Inventory of Erectile Function⁵ in men and Female Sexual Function Index⁵ in women.⁶ Main differential diagnoses in male

are premature ejaculation or psychogenic difficulties, although associations are possible.

Hypogonadism is also frequent in men with diabetes and frequently associated with ED and should be investigated and treated accordingly.⁷

The first line therapy of ED in diabetes is oral phosphodiesterase-5 Inhibitors. The use of vacuum erection device in association was shown to further improve erectile function.⁸

A meta-analysis also showed a favorable additional effect of statins on ED.⁹ In post-menopausal women, testosterone may improve sexual desire but with no other effect.¹⁰ Local oestriol or probiotics treatments may decrease dryness and pain. Long term use of the GLP-1RA, dulaglutide, has been shown to reduce the incidence of moderate to severe ED in subjects with type 2 diabetes following an exploratory analysis of the REWIND trial.¹¹

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Peripheral Neuropathy and Pain

Recommendations

- 1 At the time of diagnosis and at regular intervals (annually) thereafter older patients with diabetes should be questioned about symptoms of neuropathy and examined for the presence of peripheral neuropathy using as a minimum an assessment by a 128 Hz (cycles per second) tuning fork for vibration, a test of pin-prick sensation and a 10 g Semmes-Weinstein mono filament test for pressure perception. (3A)
- 2 In assessing neuropathic pain in older patients, we suggest that the use of instruments specifically designed for neuropathic pain (e.g. the Brief Pain Directory for Diabetic Peripheral Neuropathy) can provide important insight into patients' pain experience and is recommended. (2A)
- 3 Pregabalin can be used for painful diabetic neuropathy, starting at the lowest dose (50 mg twice a day) and then slowly increased, since with higher doses there was showed not only an increase in effectiveness but also an increase in the incidence of most adverse events (somnolence and dizziness most frequently). (4A)
- 4 Duloxetine can be considered as an alternative treatment for diabetes-related neuropathic pain (significant improvement in pain against placebo). However, there is no evidence enough to recommend Venlafaxine for diabetes-related neuropathic pain. Other tricyclic drugs are not recommended in older people due to their anticholinergic side effects. (4A)
- 5 In those older people with diabetes who are not able to communicate well (such as loss of vision, hearing, dementia, care home residency), we suggest that the use of an instrument to detect early peripheral nerve damage (e.g. Neuropad) which does not rely on verbal response may be helpful. (2A)

Rationale and evidence base

The screening of diabetic neuropathy and assessment of pain should be mandatory for older people with type 2 DM.¹

The presence of peripheral neuropathy should be assessed (as a minimum) by a 128 Hz (cycles per second) tuning fork for vibration, a test of pin-prick sensation and a 10 g Semmes-Weinstein monofilament test for pressure perception. When assessing neuropathic pain in older patients, the use of instruments specifically designed for neuropathic pain is essential. Diabetic neuropathy leads to disability² related to sensory loss and risk of foot ulcers and amputations, but also (in approximately 15 to 20 percent of patients)³ to painful symptoms which can further limit function and decrease quality of life. In those with sensory loss such as poor vision or hearing loss, and those who are demented, severely frail or living in a care home, an assessment of peripheral nerve damage without subject response, should be considered.⁴

In relation to pharmacotherapy, there is moderate evidence (few high-quality comparative trials have been done until now) for including several antidepressants (duloxetine, venlafaxine, amitriptyline and other tricyclic drugs), and gabapentinoid antiepileptic drugs (pregabalin, gabapentin) and capsaicin patch.^{5,6} However, the selection of a drug for older people should be individualized, based on functional status, comorbidities, drug interactions, side effect profiles, dosing frequency and cost. In practice, tricyclic drugs are not recommended for first line treatment because of their high anticholinergic burden. In relation to venlafaxine,⁷ there is insufficient evidence to choose this antidepressant drug for neuropathic pain unless it is indicated for co-existing depression.

Gabapentin could be an option, but it is not superior to pregabalin and it is not approved by all the regulatory agencies. For example, in the United States, FDA (Food and Drug Administration), as of 2020, the only approved therapies for diabetic neuropathy are duloxetine, pregabalin, and the capsaicin patch [8%]. Capsaicin patch could be an option too, since is relatively free of relevant side effects, but neuropathic pain often affects large areas of the body which can't be covered with the patch. In summary, pregabalin, duloxetine and capsaicin patch (in selected cases) are the pharmacological options for the management of neuropathic diabetic pain in older people with diabetes.

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Falls and Immobility

Recommendations

- 1 Measurements of hand grip force using a standard device, such as a Jamar dynamometer, in the risk assessment of falls and fractures due to sarcopaenia and motor neuropathy should be performed at least twice a year during routine clinical assessment. (4A)
- 2 All older adults with T2DM should have access to appropriate nutritional and exercise interventions, according to their level of functional status: correcting low vitamin D levels would improve muscle strength and decrease the frequency of falls. (3A)
- 3 In older adults with T2DM at increased risk of falls, glycaemic treatment and co-morbidity drug regimens should be personalized, with periodic adjustment of care plans, trying to minimize any drug-related risk of falls and to maintain a reasonably good quality of life. (3A)
- 4 Patients with repeated falls should receive a multifactorial risk assessment, with the inclusion of a Frailty Measurement (Frailty score or eFI). (3A)

Rationale and evidence base

The incidence of falls is increased in patients with diabetes, and it is of particular concern in the older population, due to the associated hip fractures and related higher morbidity and mortality rates. A large percentage of falls can be due to peripheral neuropathy, causing decreases in sensory

perception and balance, and foot disease.¹ However, older patients with T2DM are also at a significant increased risk of sarcopaenia, the age-related decline in muscle mass, quality and function, that represents one of the major factors responsible for falls and fractures in the general population. Moreover, impaired bone quality due to decreased bone turnover results in reduced bone strength that, in combination with other T2DM-specific risk factors, such as peripheral neuropathy, sarcopaenia, retinopathy, microvascular complications, obesity, co-morbidities and medications, may lead to an increased falls and fracture risk.² Appropriate nutritional and exercise interventions, as well as vitamin D supplementation in patients with deficiency, have been proven to be effective in decreasing the risk of falls and fractures.³

Hypoglycaemia, often associated to the use of insulin, is associated with increased risk of falls.⁴ In addition, falls associated with hypoglycaemia have a 70% higher risk of leading to a fracture and are more likely to result in a visit to the emergency room, hospitalization and long-term care placement.⁵ Finally, patients with T2DM on diuretics and other anti-hypertensive drugs, might be at increased risk of falls due to orthostatic hypotension, which is often worse in neuropathic involvement. Polypharmacy, associated with the reduced functional reserve and the alteration of the metabolic and clearance capacity present in the geriatric patient, especially if diabetic, leads to frequent drug interactions and adverse reactions. In particular, polypharmacy with certain analgesics, muscle relaxants and tranquilizers is considered a significant risk factor for falls in the general population, and therefore requires greater attention in T2DM patients.⁶

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Special Categories

Housebound and Frail

Recommendations

1 Patients who are housebound and frail should receive an easy-to-administer, quick, validated multifactorial risk assessment, not requiring special equipment nor professional staff (such as the electronic Frailty Index) (3A)

2 Those patients with selected functional, cognitive, nutritional impairments, at risk of pressure sores or of complications due to polypharmacy should undergo a comprehensive geriatric assessment tool (e.g. the Multidimensional Prognostic Index) by a clinician to detect and treat underlying reversible conditions, such as malnutrition, anaemia, or depression. (3A)

3 Appropriate nutritional and exercise interventions should be prescribed when applicable, based on the overall functional status of the patient (3A)

4 Glycaemic treatment and co-morbidity drug regimens should be personalised, with periodic adjustment of care plans, as well as trying to minimize any drug-related risk and to maintain a reasonably good quality of life (3A)

5 We recommend a multimodal intervention (resistance exercise, nutritional education, optimizing medical treatment) in the medical management of frailty in type 2 diabetes (3A)

Rationale and evidence base

Frailty, defined as a state of increased vulnerability resulting from aging-associated decline in reserve and function across multiple physiologic systems, is recognized as an important risk factor for death and disability in older adults with diabetes.¹ Based on these findings, scientists and clinicians recommend that frailty status should be routinely assessed in these patients (see Table 4).² A frailty assessment in an older patient with T2DM provides an "integrated marker of health", that takes into consideration the ageing process, the impact of diabetes (its duration and complications) and comorbidity, all factors interacting and determining the frailty level. Not only this intertwinability relevant, but the frailty assessment is crucial as it allows to set up a realistic and practical goal of care. Preserving residual functions and postponing the onset of disability should be

the main goal of care for frail older patients.³ Residual functions must also be evaluated to establish realistic goals of care and the actual capacity of self-management in the care process.⁴ Management of glycaemic goals and antihyperglycaemic treatment has to be individualised in accordance to the functional status, comorbidities and life expectancy, giving preference to drugs that are associated with low risks of hypoglycaemia.

Hypoglycaemia is associated with frailty and with several negative outcomes, such as fractures, hospitalization and long-term care placement, and poor quality of life.⁵ In view of the reduced functional reserve and the alteration of the metabolic and clearance capacity present in the older frail T2DM patient, it is not surprising that polypharmacy leads to frequent drug interactions and adverse reactions.⁶

The evidence from the literature is strong enough to recommend performing a comprehensive geriatric assessment and to personalise the management and the goal of care based on the frailty level of older patients with T2DM. The recent findings of the MIDFRAIL study support the use of a multimodal intervention in the management of older people with diabetes and frailty.⁷⁷

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Avoiding Hospitalisation

Recommendations

- 1 Comprehensive management of diabetes and comorbidity decreases the risk of unplanned hospitalisations. (3A)
- 2 Hypoglycemia risk must be assessed in all older patients with diabetes to minimize unnecessary admission to hospital. (3A)
- 3 We suggest that regular review by a geriatrician and/or diabetes specialist, video support 24/7, integrated care and telephone advice can help prevent 15% emergency hospital admissions from care homes. (2A)
- 4 We suggest that close working between the primary care team and care home staff should identify at-risk residents for hospital admissions and take appropriate measures such as assessing hypoglycaemic risk, frailty, and setting glucose targets to reduce unplanned admissions. (1A)

Rationale and evidence base

One major burden of diabetes is to increase the hospitalisation rate at any age and particularly in older people. In one study, more than half of older patients with diabetes experienced at least one unscheduled hospitalisation during a two-year period.¹ Avoidable hospitalisations may be those due to adverse drug events, poor diabetes control (hypo or hyperglycemia),² falls, infections³ and severe comorbidity. Particularly hypoglycaemia-related hospitalisations increase dramatically after 65y. The reduction of influenza-related hospitalization relies on vaccination.⁴ In older patients with diabetes integrative home-based management of co-morbidities targeting COPD, organs failures, cancer and severe neurological diseases decreased by 5.8% per year the risk of hospitalization.⁵ The risk of hospitalization increases after a first admission.⁶ More recently, it has been shown that regular review by a multidisciplinary team, tele-video support 24/7, integrated care and telephone advice can help prevent 15% emergency hospital admissions from care homes.⁷

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Care Home Management of diabetes

Recommendations

- 1 In view of the high rate of undiagnosed diabetes in care home residents at the time of admission to a care home, each resident requires to be screened for the presence of diabetes, and have annual screens for diabetes. (3A)
- 2 At the time of admission to a care home, we suggest that each resident with diabetes should be screened for cognitive and physical impairment including frailty as they are at higher risk to progression to disability (2A)
- 3 Residents on insulin or insulin secretagogues must have a hypoglycaemic risk assessment, and screened regularly for the presence of hypoglycaemia symptoms. (3A)
- 4 We suggest that each resident with diabetes should aim for optimal blood pressure and glucose regulation in order to maintain cognitive and physical performance. (2A)
- 5 We suggest that each resident should have an individualised plan of management that includes an exercise plan and nutritional plan which takes into account their beliefs, culture, ethnicity and personal wishes. (2A)
- 6 We suggest that a range of interventions can be considered to assist management of care home residents with diabetes such as adherence to clinical practice guidelines, de-escalation of therapy, medical optimisation and resident education, teleconsultation between specialist and care staff, and the use of basal bolus insulin regimens or basal insulin regimen only. (2A)

7 We suggest that clinicians can engage with a number of clinical guidelines to guide diabetes management in care home settings. (2A)

Rationale and evidence base

In residential long-term care facilities, about 1 in 4 residents will have diabetes and a similar number have impaired glucose tolerance and therefore at increased risk of developing diabetes.^{1,2} Diabetes in a resident is often a complex illness with evidence of frailty, multimorbidity, disability, presence of diabetes-related complications, and have a markedly reduced life expectancy.³⁻⁵ Residents with diabetes are also often overtreated, display polypharmacy and have a high admission rate to hospital. Overall, diabetes care is fragmented and less than optimal.^{4,6,7}

Hypoglycaemia can be an emergency scenario in care home residents with diabetes and management should include identifying those at greatest risk, avoiding too strict diabetes control, and ensuring adequate nutritional intake.^{3,8-10} Intensive insulin regimens should be avoided and replaced with once daily basal insulin or well monitored basal-bolus insulin regimens if recommended by a specialist. Sulphonylureas (SUs) should only be prescribed for residents who have a low hypoglycaemia risk and have a history of tolerating SUs without hypoglycaemia.^{3,11,12}

Other interventions to enhance diabetes care within long-term care settings are available but have not been sufficiently tested up to now.¹³⁻¹⁶ There are available several part-evidence based national and international guidelines available to assist clinicians and care staff to manage residents with diabetes.^{3,9,17-19}

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End of life diabetes care

Recommendations

1 We suggest that interventions in diabetes end of life care in older people need to be tailored to patient preferences and aiming at the prevention of hypoglycaemia, preventing acute metabolic decompensation, and acute hyperglycaemia symptoms (e.g. excessive thirst and excessive urination) whilst at all costs preserving a patients' quality of life, comfort and dignity. (2A)

2 We suggest that for older subjects in palliative care, maintaining blood glucose levels above 6 mmol/l will help to minimize hypoglycaemia. Maintaining blood glucose levels between 6-12 mmol/l should help to prevent symptoms of hyperglycaemia. (2A)

3 We suggest that during palliative care of frail and bedridden subjects, it is important to adopt a robust preventative strategy to minimize the development of diabetic ulcers, feet infections and pressure ulcers prevention. (1A)

4 We suggest that once an older adult with diabetes enters an end of life care phase, both the diabetes team and palliative care team discuss future management as part of a close liaison approach. (2A)

5 Advance care planning and documenting one's values, goals, and care preferences early is important and helps health professionals and other treatment decision-makers make informed decisions that reflect the individual's values and care goals and preferences. (1A)

Rationale and evidence base

The goal of diabetes management in palliative care is not in achieving normoglycaemia but to prevent hypoglycaemia and uncontrolled hyperglycaemia.¹ Very few studies have described diabetes management during end of life in older people with diabetes.²

During terminal care, food intake decreases and consists mainly in carbohydrates. In many cases, insulin at prudent dosage may be the most appropriate hypoglycemic treatment (0.2 U/kg body weight/day).³ However, during the final period of life, blood glucose decreases and usually no treatment is needed. Corticosteroids may be used to increase appetite or for symptoms relief resulting in increased needs for insulin or other glucose-lowering agents.

The palliative care of diabetes should be quality teamwork involving all care providers, endocrinologist or diabetologist, diabetes nurse educator, dietitian, primary care team, palliative care specialist, and the family of the patient.

International guidance on managing older adults with diabetes at end of life is available⁴ and more recently specific guidance from the UK⁵ also provides clinical care recommendations in this area. People and families should be involved in all advanced care plans (ACP) and end-of-life decisions.⁵

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Appendix 1

Table 4: Frailty Detection Scales for Practical Application in Primary Care

Frailty assessment tools		
Tool	Criteria	Advantage
Fried's phenotype.¹	5-point scale: weight loss, exhaustion, weakness assessed by grip strength, reduced physical activity and slowness measured by gait speed.	Identifies robust (score 0), pre-frail (score 1-2) and frail (score >3) individuals but requires two practical measurements.
Clinical frailty scale.²	9-point scale that describes patient's functional characteristics and categorise them from very fit to severely frail.	Uses clinical descriptors and pictographs to stratify older people according to level of function to predict mortality or institutionalisation.
FRAIL scale.³	5-point scale: fatigue, resistance, ambulation, illness and loss of weight.	Can be self-assessed and does not require measurements by healthcare professionals.
35-Items Rockwood frailty index.⁴	35 items, based on data from chronic diseases, disabilities in activities of daily living, cognition, nutrition, visual and hearing impairment.	Includes comprehensive data as a part of comprehensive geriatric assessment.
Electronic Frailty Index.⁵	Uses the cumulative deficit model to identify and score frailty based on routine interactions of patients with their general practitioner.	Can be used to screen for the whole practice population who are >65 years old.

PRISMA Questionnaire. ⁶	7-item questionnaire to identify frailty, a score of >3 identifies frailty.	Is suitable for postal completion.
Frailty Trait Scale. ⁷	Evaluates three dimensions of nutrition, physical activity and nervous system.	Can predict hospitalisation and mortality.
SHARE Frailty Instrument. ⁸	5 dimensions: loss of appetite, walking difficulty, exhaustion, weakness measured by grip strength and low physical activity.	Proposed for the primary health care setting and accessible via web calculators.
Gérontopôle Frailty Screening Tool. ⁹	6 questions assessing the individual's social, physical, functional and cognitive situation.	An initial screening tool in primary care to increase awareness of underlying frailty.
Edmonton Frail Scale. ¹⁰	9 domains: cognition, physical function, general health, independence, social support, pharmacological condition, nutrition, mental condition and continence.	Can be completed by people without special training in geriatric medicine.
Multidimensional prognostic index. ¹¹	8 domains: disability in ADL, disability in IADL, number of medications, nutritional aspects, social aspects, risk of pressure sores, cognition, comorbidities	Accurate in predicting mortality and other negative outcomes in older people, no special training needed for its administration

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