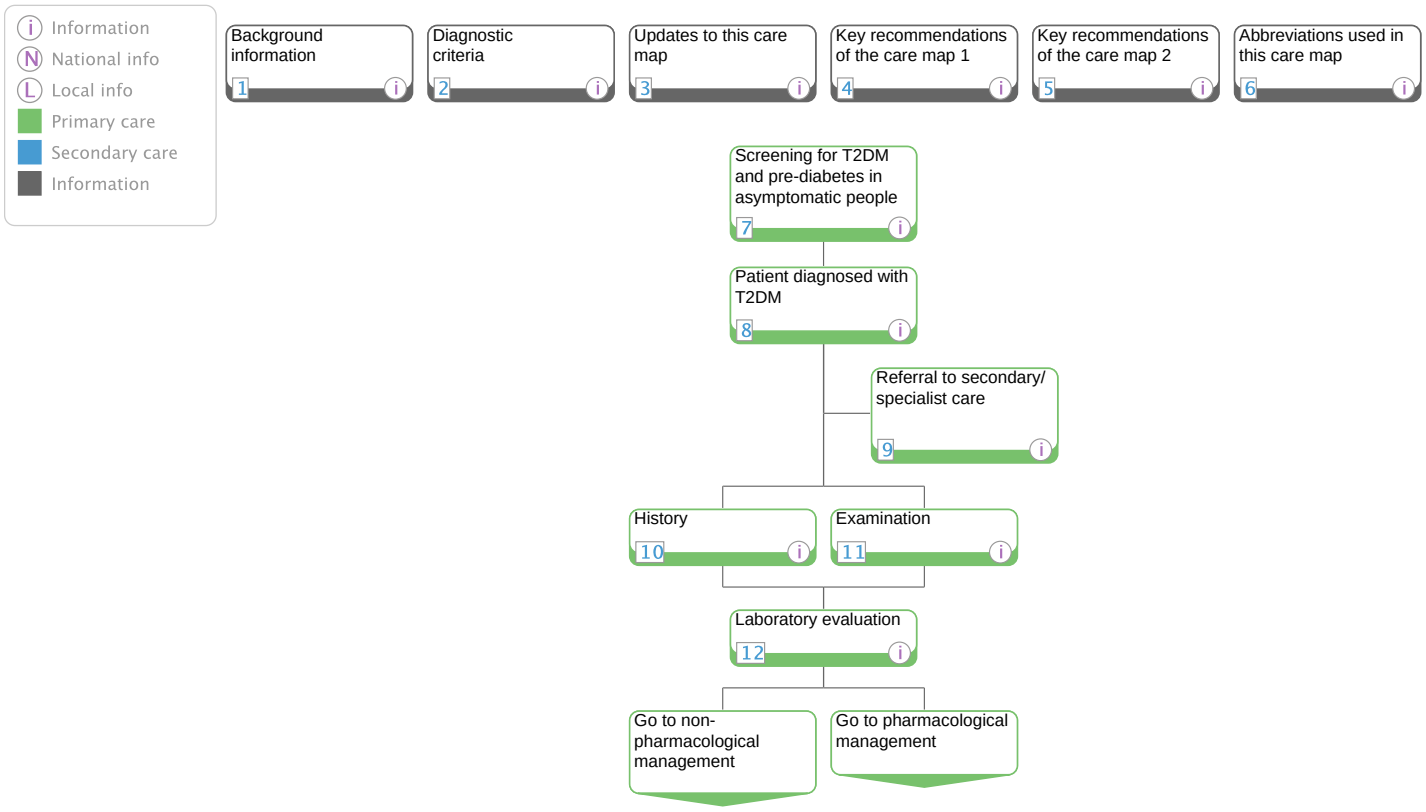
T2DM in adults and elderly - investigations

Medicine > Endocrinology > Type II diabetes mellitus (DM) in adults and the elderly



Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

This care map was published by Qatar. A printed version of this document is not controlled so may not be up-to-date with the latest clinical information.

T2DM in adults and elderly - investigations

1 Background information

Quick info:

The purpose of this care map is to define the appropriate diagnosis and management of T2DM in adults and the elderly. The objective is to improve the appropriateness of investigation, prescribing, and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary care and outpatient settings.

Scope

Aspects of care covered in this care map include the following:

- Assessment and management of T2DM in adults and older adults, including:
  - Screening for T2DM and prediabetes.
  - Comprehensive medical evaluation.
  - Lifestyle and non-pharmacological management of confirmed type 2 diabetes.
  - Glycaemic targets and glucose monitoring.
  - Pharmacological treatment for T2DM.
  - Hypoglycaemia prevention and management.
  - Management considerations in older adults.

Aspects of care not covered in this care map include the following:

- Management of complications of diabetic foot disease, renal disease, eye disease, and atherosclerotic cardiovascular disease risk.
- Diabetes in children and adolescents.
- Diabetes in pregnancy.
- Management of DKA or HHS.

Classification

The general categories of diabetes are classified as follows [1-3]:

- T1DM is caused by damage to the insulin-producing beta-cells within the pancreas. This results in an absolute deficiency of insulin, requiring exogenous replacement.
- T2DM is caused by a progressive reduction in insulin secretion occurring in conjunction with increasing resistance to endogenous insulin.
- GDM is carbohydrate intolerance that occurs in pregnant women without known pre-existing diabetes
- Specific types of diabetes due to other causes, such as [1]:
  - Monogenic diabetes syndromes, e.g.:
    - Neonatal diabetes.
    - Maturity-onset diabetes of the young.
- Secondary diabetes includes:
  - Diseases of the exocrine pancreas [1,2]:
    - Any process that extensively injures the pancreas can cause diabetes e.g., cystic fibrosis, haemochromatosis.
- Pancreatitis.
- Trauma.
- Infection.
- Pancreatectomy.
- Pancreatic carcinoma.
  - Drug- or chemical-induced diabetes, e.g. [1]:
    - With glucocorticoid use.
    - In HIV/AIDS treatment.
    - After organ transplantation.
  - Endocrinopathies [2]:
    - Acromegaly.
    - Cushing’s syndrome or disease.
    - Glucagonoma.

Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

- Pheochromocytoma.
- Hyperthyroidism.

Risk factors

Modifiable risk factors for T2DM include [1,5,6]:

- Overweight or obesity.
- Smoking.
- Physical inactivity/sedentary lifestyle.
- Sleep apnoea.
- Hypertension, dyslipidaemia, or ASCVD.
- Prediabetes and/or metabolic syndrome.
- PCOS, acanthosis nigricans, and NAFLD.
- Certain medications, e.g.:
  - Glucocorticoids.
  - Thiazide diuretics.
  - Antipsychotics.

Non-modifiable risk factors for T2DM include [1,5]:

- Age ≥40 years.
- Family history of T2DM.
- Previous history of GDM or previous delivery of a baby weighing ≥4 kg (9 lb).
- Member of an at-risk racial or ethnic subgroup.

Epidemiology

The International Diabetes Federation estimates the prevalence of T2DM in Qatar – all nationalities to be 13.5% [7].

The 2012 Qatar STEPwise survey conducted with Qatari adults aged 18-64 years showed the following results amongst all the respondents [8]:

- 12.7% had been diagnosed with diabetes in the previous 12 months:
  - The rate was slightly higher in women at 13.3%, when compared to men at 12%.
  - There was an increase in rates with increasing age.
  - Of those diagnosed:
    - 29.3% received insulin.
    - 61.7% received oral anti-diabetic medicines.
- 16.7% had a raised BG of ≥6.11 mmol/L (110 mg/dL).
- 5.8% were found to have IFG.
- 66% of all respondents had a positive family history of diabetes – in parents, children, brothers and sisters.

References:

Please see the care map's Provenance.

2 Diagnostic criteria

Quick info:

Type 2 diabetes

The diagnosis of T2DM requires one of the following [1]:

- Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL) (where fasting is for at least 8 hours).
  - A plasma glucose of >11.1 mmol/L (200 mg/dL) recorded 2 hours after the administration of 75g of anhydrous glucose dissolved in water as part of an OGTT.
  - Patients who have exhibited symptoms of a hyperglycaemia with a random plasma glucose reading of >11.1 mmol/L (200 mg/dL).
- HBA_{1C} of ≥6.5%:
  - Does not require the patient to fast.

- Some haemoglobinopathies and anaemias may make interpretation difficult:
- For patients with abnormal haemoglobin, but normal red blood cell turnover, an HBA_{1C} assay without interference from abnormal haemoglobins should be used [1][**L2**].

NB [1,4]:

- A second diagnostic test is required to confirm the diagnosis, unless [1][**L2**]:
  - Patient is in hyperglycaemic crisis.
  - Patient has classic symptoms of hyperglycaemia and a random plasma glucose ≥11.1 mmol/L – 200 mg/dL.
  - The results are unequivocal [**R-GDG**].
- If a second blood test is needed to confirm the diagnosis, the same diagnostic test should be used as previously but on a new blood sample.
- If two different diagnostic tests produce inconsistent results, the test that is above the diagnostic threshold should be repeated as soon as possible
- If a repeat test is below the diagnostic threshold, the test should be repeated again after 3-6 months.
- Only BG criteria should be used to diagnose diabetes in conditions associated with increased red blood cell turnover, e.g.:
  - Erythropoietin therapy.
  - Pregnancy – second and third trimesters.
  - Recent blood loss or transfusion.
  - Haemolysis.

Prediabetes

Pre-diabetes is diagnosed if any of the following criteria are met [1]:

- IFG:
  - Fasting plasma glucose 5.6-6.9 mmol/L – 100-125 mg/dL.
  - Where fasting is for at least 8 hours.
- IGT:
  - 2-hour plasma glucose 7.8-11.0 mmol/L – 140-199 mg/dL during OGTT performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.
- HBA_{1C} of 5.7-6.4%.

References:

Please see the care map's Provenance.

3 Updates to this care map

Quick info:

Date of publication: 24-Apr-2017

Please see the care map's Provenance for additional information on references, contributors, and the editorial process.

4 Key recommendations of the care map 1

Quick info:

The key recommendations of this care map are:

Diagnosis:

- The diagnosis of T2DM requires one of the following [1]:
  - Fasting plasma glucose ≥7.0 mmol/L – 126 mg/dL.
  - A plasma glucose of >11.1 mmol/L (200 mg/dL) recorded 2 hours after the administration of 75g of anhydrous glucose dissolved in water as part of an OGTT.
  - Patients who have exhibited symptoms of a hyperglycaemia with a random plasma glucose reading of >11.1 mmol/L (200 mg/dL).
  - HBA_{1C} of ≥6.5%.
- Pre-diabetes is diagnosed if any of the following criteria are met [1]:

- Fasting plasma glucose 5.6-6.9 mmol/L – 100-125 mg/dL.
- 2-hour plasma glucose 7.8-11.0 mmol/L – 140-199 mg/dL during OGTT performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.
- HBA_{1C} of 5.7-6.4%.

Screening:

- Consider screening for T2DM and pre-diabetes:
  - In all adults with a BMI ≥25 kg/m^2 and one additional risk factor for T2DM (See *'Background information'* care point) [**R-GDG**]:
    - Use lower BMI thresholds in South-Asian people [**R-GDG**].
  - If tests are negative, repeat screening every 3 years, with consideration given to more frequent testing depending on initial results [1][**L3, RGA2**].

Non-pharmacological management:

- Patients should receive care within a specialised MDT.
- The management plan should be individualised to the patient [1,9][**L2**].
- DSME programmes should comprise of [9,10]:
  - Smoking cessation [1,9,11].
  - Physical activity and exercise [1,12-14]:
    - Patients who take insulin and/or insulin secretagogues are at increased risk of hypoglycaemia as a result of exercise.
    - Intense activities may raise BG levels instead of lowering them.
  - Individualised medical nutrition therapy, preferably delivered by a registered dietician [1][**L1, RGA1**].
  - Immunisation [1,15,16].
  - Psychosocial screening [1][**L2**].
  - Weight management [1].

Glucose monitoring and treatment targets [1,9]:

- A reasonable HBA_{1C} goal for non-pregnant adults is ≤7.0%.
- Lower HBA_{1C} goals, e.g. ≤6.5%, may be considered if it can be achieved without problematic hypoglycaemia.
- A higher HBA_{1C} goal, e.g. ≤8.0% may be acceptable for patients with:
  - A history of severe hypoglycaemia.
  - Limited life expectancy.
  - Advanced microvascular or macrovascular complications.
  - Extensive comorbidities.
  - Poor engagement despite multiple attempts to improve glycaemic control.

Self- monitoring of blood glucose (SMBG):

- SMBG should be used in the following groups [1,9]:
  - Insulin-treated diabetics.
  - Patients with a history or symptoms of hypoglycaemic episodes.
  - Patients taking medication associated with increased risks of hypoglycaemia, e.g. a sulfonylurea.
  - Patients who are pregnant or planning pregnancy.
- Patients who do not require insulin therapy may also benefit from SMBG [**R-GDG**].

References:

Please see the care map's Provenance.

5 Key recommendations of the care map 2

Quick info:

The key recommendations of this care map are:

Pharmacotherapy for T2DM:

- The risks and benefits of drug treatment and the options available should be discussed with the patient [1,9].

Monotherapy:

- If tolerated and not contraindicated, metformin monotherapy is the usual initial treatment [1][**L1**].
  - Stop metformin if the eGFR is ≤30 mL/min/1.73m^2 [9,17].
  - Prescribe metformin with caution in patients at risk of a sudden deterioration in kidney function and those at risk of their eGFR falling below 45 mL/min/1.73m^2 [9][**L2**].
  - Patients on metformin should be monitored for vitamin B12 deficiency [11][**L2**]:
- If metformin is not tolerated or contraindicated, consider monotherapy with any of the following [1,9]:
  - SU.
  - TZD.
  - DPP-4 inhibitor.
  - SGLT2 inhibitor.
  - GLP-1 receptor agonist.
  - Basal insulin.

Dual therapy:

- If the patient's HBA_{1C} target is not achieved after approximately 3 months of monotherapy or the patient's HBA1C is ≥9.0%, commence dual therapy [1].
- Dual therapy comprises of metformin plus one of [1,17]:
  - SU.
  - TZD.
  - DPP-4 inhibitor.
  - SGLT2 inhibitor.
  - GLP-1 receptor agonist.
  - Basal insulin.

Triple therapy:

- If the HBA_{1C} goal has not been achieved after 3 months of dual therapy, then triple therapy should be commenced. The exact regimen should be dependent on patient- and disease-specific factors [1,17].
- Triple therapy comprises of any combination of the following drugs [1,17]:
  - Metformin plus any two of:
    - SU.
    - TZD.
    - SGLT2 inhibitor.
    - Either a DDP-4 inhibitor or a GLP-1 receptor agonist.
    - Basal insulin.
  - NB: Avoid the use of a DPP-4 inhibitor in combination with a GLP-1 receptor agonist [1].
- The prescription of a GLP-1 receptor agonist to be taken in conjunction with insulin should only be given after discussion with a specialist and with long-term support from a consultant-led diabetes MDT [9][**L3, RGA2**].

Combination injectable therapy:

- Comprises of [1,17]:
  - Metformin; with
  - Basal insulin; with either
  - Mealtime insulin or a GLP-1 receptor agonist.
- Consider starting combination injectable therapy when HBA_{1C} is ≥10%, especially if symptomatic.

Insulin therapy:

- Insulin, with or without additional medications, should be considered in newly diagnosed patients [1][**L2, RGA2**]:
  - Who are markedly symptomatic and/or have elevated BG or HBA_{1C}.
  - Do not use insulin as a threat'
  - Do not describe insulin as a failure or punishment
  - A self-care algorithm using SMBG for titration of insulin doses may benefit patients managed with insulin.
- Consider insulin in patients who are not newly diagnosed [5][**L1**]:

- When non-insulin anti-hyperglycaemic therapy fails to attain glycaemic control.
- When a patient has symptomatic hyperglycaemia.
- NB: Insulin therapy should not be delayed in patients with T2DM who are not attaining glucose goals [1].

- See the *'Insulin therapy'* care point on the '*Pharmacological management*' page for information on the initiation of insulin therapy.

Referral from primary/generalist care to secondary/specialist care

- See the *'Triple therapy'* and *'Glycaemic control not achieved – CSII'* care points on the '*Pharmacological management*' page for specific criteria for appropriate referral.

Considerations for elderly patients:

- Older adults with diabetes should be screened and monitored for cognitive impairment [1][**L2, RGA1**].
- Consider screening and treating depression in older adults, ≥ 65 years of age with diabetes as a high priority [1][**L2**].

Treatment goals in the elderly:

- In elderly patients who are cognitively and functionally intact, and have significant life expectancy, consider setting treatment targets which are similar to those used in younger adults [1][**L3, RGA2**].
- Blood glucose targets may be relaxed in elderly adults on an individual basis, e.g. in patients with [1][**L3, RGA2**]:
  - Advanced diabetes.
  - Life-limiting comorbid illness.
  - Substantial cognitive or functional impairment.

HBA_{1C} targets [28]:

- A target of <7.0% should be set, if it can be achieved without problematic hypoglycaemia in the following patients:
  - With absent or very mild microvascular complications; and
  - Who are free of major concurrent illnesses; and
  - Who have a life expectancy of at least 10-15 years.
- A target of <8.0% should be set in the following patients:
  - A longer duration diabetes – >10 years.
  - With comorbid conditions.
  - Who need combination medication treatments, including insulin.
- A target of 8.0-9.0% should be set for patients with any of the following:
  - Advanced microvascular complications.
  - Major comorbid conditions.
  - Life expectancy of <5 years.

Pharmacological therapy in the elderly:

- See the '*Pharmacological therapy*' care point in the '*Considerations in older adults*' page.
- Common comorbidities to consider when managing diabetes include [27][**L2**]:
  - Confusion, cognitive dysfunction, and delirium.
  - Depression.
  - Physical disability.
  - Skin problems, e.g. infections, ulcers, and delayed wound healing.
  - Hearing and vision impairment.
  - Oral health problems, teeth decay, and dry mouth.

References:

Please see the care map's Provenance.

6 Abbreviations used in this care map

Quick info:

The abbreviations used in this care map are as follows:

ACC/AHA

American College of Cardiology / American Heart Association

ACE

Angiotensin converting enzyme

ACR

Albumin-creatinine ratio

ADL

Activities of daily living

AIDS

Acquired immune deficiency syndrome

ALT

Alanine aminotransferase

ARB

Angiotensin receptor blocker

ASCVD

Atherosclerotic cardiovascular disease

BG

Blood glucose

BMI

Body mass index

BP

Blood pressure

CCB

Calcium channel blocker

CGM

Continuous glucose monitoring

CKD

Chronic kidney disease

CSII

Continuous subcutaneous insulin infusion

DESMOND

Diabetes education and self-management for ongoing and newly diagnosed

DKA

Diabetic ketoacidosis

DPP-4

Dipeptidyl peptidase-4

DSME

Diabetes self-management education

DSMS

Diabetes self-management support

eGFR

Estimated glomerular filtration rate

GDM

Gestational diabetes mellitus

GLP-1

Glucagon-like peptide-1

HAAF

Hypoglycaemia-associated autonomic failure

HBA_{1C}

Glycated haemoglobin level

HDL-C

High-density lipoprotein cholesterol

HIV

Human immunodeficiency virus

Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

IFG
Impaired fasting glucose
IGT
Impaired glucose tolerance
IV
Intravenous route
LDL-C
Low-density lipoprotein cholesterol
MDT
Multi-disciplinary team
MNT
Medical nutrition therapy
MOPH
Ministry of Public Health of Qatar
NAFLD
Non-alcoholic fatty liver disease
NPH
Neutral protamine Hagedorn
OGTT
Oral glucose tolerance test
PCOS
Polycystic ovary syndrome
PCV13
13-valent pneumococcal conjugate vaccine
PHQ-2
2-question patient health questionnaire
PHQ-9
9-question patient health questionnaire
PPSV23
23-valent pneumococcal polysaccharide vaccine
SGLT-2
Sodium glucose cotransporter-2
SMBG
Self-monitoring of blood glucose
SU
Sulfonylurea
T1DM
Type 1 diabetes mellitus
T2DM
Type 2 diabetes mellitus
TZD
Thiazolidinedione

7 Screening for T2DM and pre-diabetes in asymptomatic people

Quick info:

Any of the following tests are appropriate for screening asymptomatic people for T2DM and pre-diabetes [1]:

- Fasting plasma glucose.
- 2-hour post-glucose level on a 75 g OGTT.
- HBA_{1C}.

Consider screening for T2DM and pre-diabetes:

Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

- In all adults with a BMI ≥25 kg/m^2 and one additional risk factor for T2DM (see the *'Background information'* care point) [**R-GDG**]:
  - Use lower BMI thresholds in South-Asian people [**R-GDG**].
- If tests are negative, repeat screening every 3 years, with consideration given to more frequent testing depending on initial results [1][**L3, RGA2**].

References:

Please see the care map's Provenance.

8 Patient diagnosed with T2DM

Quick info:

In patients diagnosed with T2DM, a comprehensive evaluation should be carried out at the initial visit, which includes [1]:

- Diagnosis and diabetes classification confirmation.
- A full history, examination and appropriate investigations to review all co-morbidities. A review of prior treatments and risk factor control in patients with established diabetes.
- The full involvement of the fully-informed patient to prepare an appropriate care plan.

References:

Please see the care map's Provenance.

9 Referral to secondary/specialist care

Quick info:

Consider referring the following groups of patients from primary/generalist care to secondary/specialist care [**R-GDG**]:

- Any pregnant woman who is a known diabetic or is diagnosed with T2DM during pregnancy screening.
- Patients suspected or confirmed to have monogenic diabetes.
- Patients with suspected or confirmed secondary diabetes that requires specialist treatment, e.g. post-pancreatectomy).
- Patients with diabetic foot disease that cannot be managed in primary care.
- All patients with cystic fibrosis.
- Patients with T2DM and evidence for end organ damage should be referred for shared care with endocrinology e.g. post-MI, neuropathy, retinopathy, or nephropathy.
- Transplant patients with pre-diabetes or confirmed T2DM.

References:

Please see the care map's Provenance.

10 History

Quick info:

A comprehensive medical history should be taken, including [1][**L2**]:

- Confirmation of the diagnosis.
- Age and features of onset of diabetes, e.g.:
  - Asymptomatic laboratory finding; or
  - Symptomatic presentation.
- Review of previous treatment regimens, if any, and response to therapy.
- Results of glucose monitoring.
- Diet and physical activity assessment.
- History of smoking, alcohol consumption, or substance use.
- History of acute complications, e.g.:
  - DKA.
  - Hypoglycaemia.

Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

- Hyperglycaemic hyperosmolar state.
- History of microvascular complications:
  - Retinopathy.
  - Nephropathy.
  - Neuropathy
  - Diabetic foot problems.
  - Erectile dysfunction.
  - Gastroparesis.
- History of macrovascular complications:
  - Coronary artery disease.
  - Cerebrovascular disease.
  - Peripheral vascular disease.
- Diabetes education, self-management, and support history and needs.

Comorbidities for assessment and consideration in T2DM include [1][**L2**]:

- Hypertension.
- Dyslipidaemia.
- Obesity.
- Fatty liver disease.
- Heart failure.
- Obstructive sleep apnoea.
- Low testosterone in men.
- Depression.

References:
Please see the care map's Provenance.

11 Examination

Quick info:

A full general physical examination should be performed at the first visit, addressing the following in particular [1][**L2**]:

- BMI.
- BP.
- Skin examination, e.g.:
  - Acanthosis nigricans.
  - Injection sites, if any.
- Comprehensive foot examination:
  - Inspection – particularly for deformities, ulcers, pre-ulcerative signs, inadequate footwear, and poor hygiene.
  - Palpation of dorsalis pedis and posterior tibialis pulses.
  - Patellar and Achilles tendon reflexes.
  - Determination of proprioception, vibration, pinprick, and monofilament sensation.

References:
Please see the care map's Provenance.

12 Laboratory evaluation

Quick info:

Laboratory evaluation comprises of [1]:

- HBA_{1C}, if there are no results available from the past 3 months [1][**L2**].
- If the following are not performed or available within the past year perform the following [1][**L2**]:

- Fasting lipid profile.
- Liver function tests.
- Spot urinary ACR.
- Serum creatinine and eGFR.
- Thyroid stimulating hormone in patients with dyslipidaemia or in women aged over 50 years.
- Vitamin B12 level for patients taking metformin.

References:

Please see the care map's Provenance.

Published: 27-Apr-2017 Valid until: 30-Apr-2019 Printed on: 08-Nov-2017

Type 2 diabetes mellitus in adults and the elderly

Provenance Certificate

Overview

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

This care map was approved on **24 Apr 2017**.

For information on changes in the last update, see the information point entitled 'Updates to this care map' on each page of the care map.

Editorial approach

This care map has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The care map will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this care map, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the care map by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the care map, the MOPH has not influenced the specific recommendations made within it.

Sources of evidence

The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).

3. Address an aspect of specific importance to the guideline in question.

Where included, the 'goal length of stay' stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

Evidence grading and recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.

Type 2 diabetes mellitus in adults and the elderly

References

1. Cefalu WT, Bakris G, Blonde L et al. American Diabetes Association: Standards of medical care in diabetes - 2016. Diabetes Care 2016; 39: s1-s112.

2. American Diabetes Association (ADA). Diagnosis and classification of diabetes mellitus. Diabetes Care 2014. 37:S81-S90.

3. Hod M, Kapur A, Sacks DA, Hadar E et al. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus: A pragmatic guide for diagnosis, management, and care. International Journal of Gynecology and Obstetrics 2015. 131(S3): S173–S211.

4. Sacks DB, Arnold M, Bakris GL et al. Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. Diabetes Care 2011; 34: 1419-23.

5. Handelsman Y, Bloomgarden ZT, Grunberger G et al. American Association of Clinical Endocrinologists (AACE) and American College of Endocrinology (ACE) - clinical practice guidelines for developing a diabetes mellitus comprehensive plan - 2015. Endocrine Practice 2015; 21: 1-86.

6. Mechanick JI, Youdim A, Jones DB et al. Clinical practice guidelines for the perioperative nutritional, metabolic and nonsurgical support of the bariatric surgery patient - 2013 update. Endocrine Practice 2013; 19: e1-336.

7. International Diabetes Federation (IDF). IDF Diabetes Altas. Seventh edition. Brussels, Belgium: IDF; 2015.

8. Supreme Council of Health. Qatar Stepwise Report 2012. Doha: SCH, 2013.

9. National Institute for Health and Care Excellence (NICE). Type 2 diabetes in adults: management. NICE NG28. London: NICE; 2016.

10. Davies MJ, Heller S, Skinner TC, Campbell MJ et al. Effectiveness of the diabetes education and self management for ongoing and newly diagnosed (DESMOND) programme for people with newly diagnosed type 2 diabetes: cluster randomised controlled trial. BMJ. 2008; 336(7642):491-5.

11. Garber AJ, Abrahamson MJ, Barzilay JI et al. Consensus statement by the American Association of Clinical Endocrinologists (AACE) and American College of Endocrinology (ACE) on the comprehensive type 2 diabetes management algorithm - 2016 executive summary. Endocrine Practice 2016; 22: 84-113.

12. National Institute for Health and Care Excellence (NICE). Type 2 diabetes: prevention in people at high risk. NICE PH38. Manchester: NICE; 2012.

13. Al-Bibi K, The state of Qatar. National physical activity guidelines. 1st edn. Doha, Qatar: Orthopaedic & Sports Medicine Hospital; 2014.

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

15. Ministry of Public Health. National immunisation guidelines for vaccine providers. 2016.

16. Supreme Council of Health. Pneumococcal vaccination in children and teens. 2015.

17. Inzucchi SE, Bergenstal RM, Buse JB et al. Management of hyperglycemia in type 2 diabetes, 2015: A patient centered approach. Diabetes Care 2015; 38: 140-9.

18. Qatar National Formulary. Ministry of Public Health; 2016. Available at: http://crlonline.com/en/ [Accessed 18th December 2016].

19. International Diabetes Federation and the DAR International Alliance. Diabetes and Ramadan: Practical Guidelines. Brussels, Belgium: International Diabetes Federation, 2016. Available at: www.idf.org/guidelines/diabetes-in-ramadan [Accessed 18th December 2016].

20. Qatar Diabetes Association (QDA). Ramadan Advice. Doha, State of Qatar: QDA; 2016.

21. National Clinical Guideline Centre (NCGC). Hypertension: The clinical management of primary hypertension in adults. Clinical Guideline 127. London: NCGC; 2011.

22. National Institute for Health and Care Excellence Internal Clinical Guidelines Team. Type 2 diabetes in adults: management. Clinical Guideline NG28. London: NICE; 2015.

23. Stone NJ, Robinson JG, Lichtenstein AH et al. 2013 American College of Cardiology/American Heart Association guideline on the treatment of blood cholesterol to reduce atherosclerotic cardiovascular risk in adults: a report of the ACC/AHA Task Force on Practice Guidelines. Circulation 2014; 129 Suppl 2:1-45.

24. National Institute for Health and Care Excellence (NICE). Ezetimibe for the treatment of primary heterozygous-familial and non-familial hypercholesterolaemia. Technology appraisal 385. London: NICE; 2016.

25. Catapano AL, Graham, I, De Backer G, Wickland O et al. ESC/EAS Guidelines for the management of dyslipidaemias. Euro Heart J. 2016. 37:2999–3058.

26. Scottish Intercollegiate Guidelines Network (SIGN). Antithrombotics: indications and management. SIGN 129. Edinburgh: SIGN; 2013.

27. Munshi MN, Florez H, Huang ES et al. Management of diabetes in long-term care and skilled nursing facilities: A position statement of the American Diabetes Association. Diabetes Care 2016; 39: 308-18.

28. Kirkman MS, Jones Briscoe V, Clark N et al. Diabetes in older adults. Diabetes Care 2012; 35: 2650-64.

Guideline Development Group members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

Guideline Development Group members		
Name	**Title**	**Organisation**
Dr Abeer Abu Abbas	Clinical Operations & Support Manager	Primary Health Care Corp
Dr Dabia Hamad S H Al-Mohanadi	Senior Consultant Endocrinologist, Head of Technology and Diabetes Unit	Hamad Medical Corp
Dr Ahmed M. Hussein Babiker	Head of Registration Section & Clinical Pharmacist	Dept of Pharmacy and Drug Control, MOPH[1]
Dr Mohammed Bashir	Consultant Endocrinologist	Hamad Medical Corp
Mr Ragae Ahmad M. Dughmosh	Senior Nursing Educator	Hamad Medical Corp
Dr Mohammed Elrishi	Consultant Endocrinologist	Al Ahli Hospital
Dr Arif Mahmood	Consultant, Family Medicine	Qatar Petroleum
Dr Mohsin Saleh Ahmed Mismar	NCD Service Development Lead	Primary Health Care Corp

[1] Dr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.

Type 2 diabetes mellitus in adults and the elderly

Guideline Development Group members		
Name	**Title**	**Organisation**
Dr Navas Naddukkandiyil	Chair of Quality & Patient Safety Geriatric Medicine	Hamad Medical Corp
Mr Basim Odeh	Nursing Affairs Specialist	Primary Health Care Corp
Dr Mahmoud Ali Zirie	Senior Consultant & Head of Endocrinology	Hamad Medical Corp

Responsibilities of healthcare professionals

This care map has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.
The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

Acknowledgements

The following individuals are recognised for their contribution to the successful implementation of the National Diabetes Guidelines.

Healthcare Quality Management and Patient Safety Department of the MOPH:

- **Ms Huda Amer Al-Katheeri**, *Acting Director & Project Executive.*
- **Dr Alanoud Saleh Alfehaidi**, *Guideline & Standardisation Specialist.*
- **Dr Ilham Omer Siddig**, *Guideline & Standardisation Specialist.*
- **Ms Maricel Balagtas Garcia**, *Guideline Standardisation Coordinator.*
- **Dr Rasmeh Ali Salameh Al Huneiti**, *Research Training & Education Specialist.*
- **Mr Mohammad Jaran**, *Risk Management Coordinator.*

Contributors:

- **Prof Abdul Badi Abou Samra**, *Chairman, Department of Medicine, Hamad Medical Corporation, Director of Qatar Metabolic Institute and Co-Chair of the National Diabetes Committee.*
- **Dr Al-Anoud Mohammed Al-Thani**, *Manager, Health Promotion & Non-Communicable Diseases, MOPH and Co-Chair National Diabetes Committee.*
- **Mr Steve Phoenix**, *Chief of General Hospitals Group & Senior Responsible Owner of Pillars 3 & 4 of the National Diabetes Strategy, Hamad Medical Corporation.*
- **Dr Mahmoud Ali Zirie**, *Senior Consultant, Head of Endocrinology, Hamad General Hospital & Senior Responsible Officer for Pillar 3 of the National Diabetes Strategy.*
- **Dr Samya Ahmad Al Abdulla**, *Senior Consultant Family Physician, Executive Director of Operations, Primary Health Care Corporation.*
- **Dr Aiman Hussein Farghaly**, *Public Health Specialist, Public Health Department MOPH.*
- **Mr Daniel Mills**, *Assistant Executive Director, Hamad Medical Corporation.*
- **Ms Ioanna Skaroni**, *Strategy Manager, Hamad Medical Corporation.*

Type 2 diabetes mellitus in adults and the elderly

Hearst Health International:

- **Dr Mehmood Syed,** *Middle East Clinical Director & Project Clinical Lead.*
- **Mr Michael Redmond,** *Clinical Programmes Manager.*
- **Ms Deepti Mehta,** *Editorial and Research Manager.*
- **Ms Rebecca Cox,** *Editorial and Research Team Leader.*
- **Ms Shuchita Deo,** *Lead Editorial Assistant.*
- **Ms Siobhan Miller,** *Editorial Assistant.*
- **Ms Fatima Rahman,** *Editorial Assistant.*
- **Ms Tahmida Zaman,** *Editorial Assistant.*
- **Ms Emma Ramstead,** *Information Specialist.*
- **Dr Amy Glossop,** *Clinical Editor.*
- **Dr Zara Quail,** *Clinical Editor.*
- **Dr Sabine Fonderson,** *Clinical Editor.*