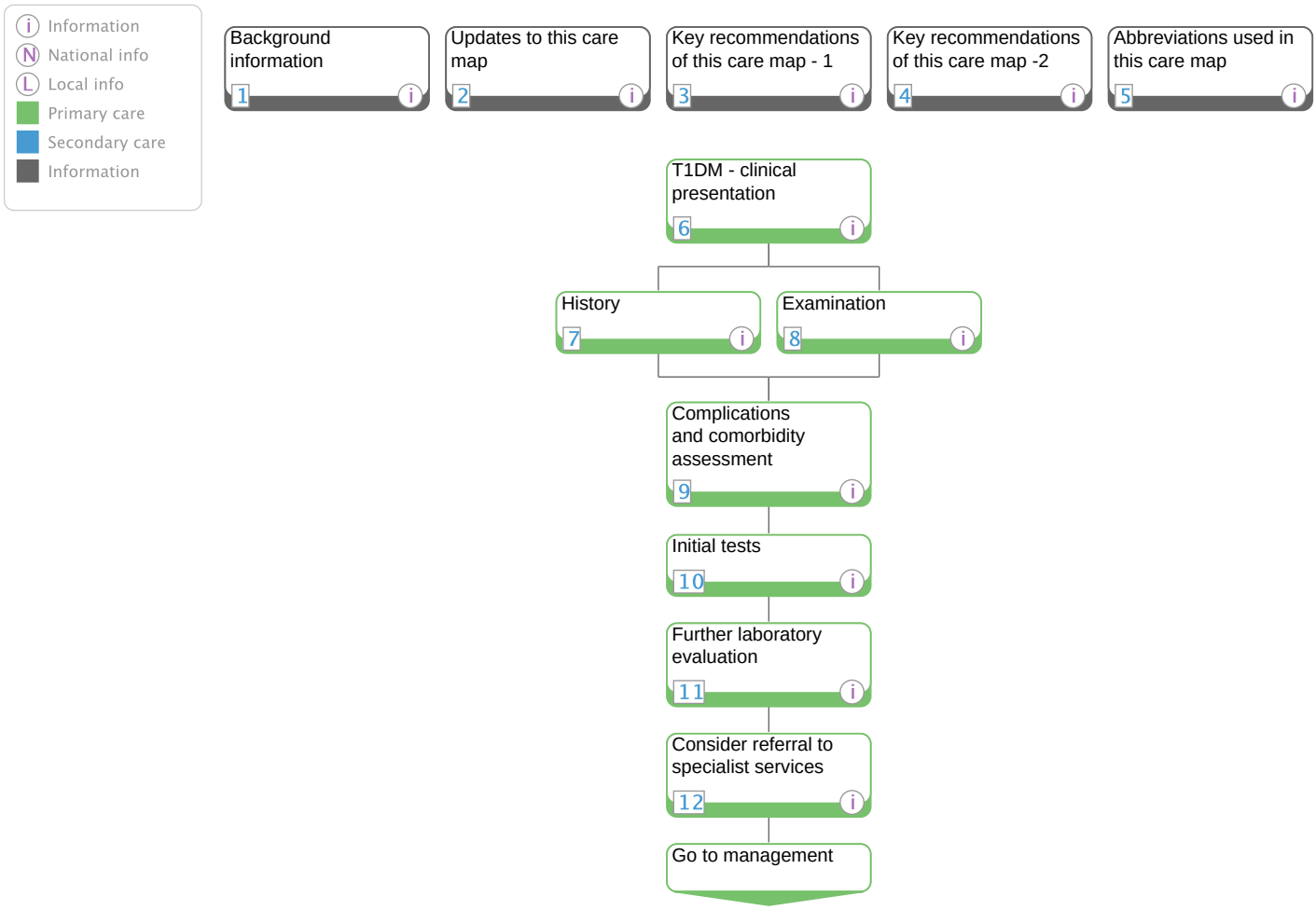
T1DM in adults and elderly - initial assessment

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



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T1DM in adults and elderly - initial assessment

1 Background information

Quick info:

Objective and purpose of the care map

The purpose of this care map is to define the appropriate diagnosis and management of T1DM 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 care map will be used primarily by physicians in primary care and outpatient settings.

Scope of the care map

Aspects of care covered within this care map include:

- Assessment and management of T1DM in adults and elderly, including:
  - Diagnosis.
  - Lifestyle management.
  - Pharmacological management.
  - Considerations in older adults.

Aspects of care not covered within this care map include:

- T1DM in children and adolescents.
- Management of diabetes in pregnancy.
- Detailed discussion of the chronic complications of T1DM.

Classification

T1DM:

- Arises as the result of beta-cell insufficiency or destruction, usually leading to absolute insulin deficiency [1,2]

Immune mediated T1DM [1]:

- Is due to cellular-mediated autoimmune destruction of pancreatic beta-cells.
- Is defined by the presence of one or more autoimmune markers [1].
- Strong HLA associations, with linkage to the DQA and DQB genes [1]:
  - HLA-DR/DQ alleles can either predispose to, or protect against, T1DM.

Idiopathic T1DM [1]:

- Insulinopaenia in the absence of beta-cell autoimmunity.
- Strongly inherited (usually of African or Asian ancestry) and not HLA-associated.
- Patients typically have an intermittent requirement for insulin replacement therapy [**R-GDG**].

Risk factors:

- Family member with T1DM (15-fold increase in risk) [2].
- Genetics:
  - Predisposing haplotypes include [3]:
    - DRB1*0401-DQB1*0302.
    - DRB1*0301-DQB1*0201.
- Viral infections [3].
- Psychological trauma [3].

Epidemiology:

The 2013 prevalence of T1DM in children in Qatar was 11.4 per 100,000 [3]. The incidence and prevalence of T1DM is increasing worldwide [1,3].

Immune mediated diabetes [1]:

- Accounts for 5-10% of diabetes.
- Most commonly manifests in childhood and adolescence but may also occur later in life.

References:

Please see the care map's Provenance.

2 Updates to this care map

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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.

3 Key recommendations of this care map - 1

Quick info:

The key recommendations of this care map are:

Clinical presentation (see the '*T1DM clinical presentation*' care point):

The clinical presentation of T1DM in adults:

- Typically has a more gradual onset than in children, with slower destruction of beta-cells [1,2].
- May initially appear consistent with T2DM, and differentiating between T1DM and T2DM may be challenging [2].
- Clinical clues suggestive of T1DM may include [2]:
  - A lean individual with:
    - Clinical symptoms of hyperglycaemia.
    - Without a first-degree relative with diabetes.
    - But often with a history of distant relatives with T1DM or other autoimmune disease.
    - NB: It should be noted that obesity does not rule out autoimmunity.
  - Adults may retain sufficient beta-cell function to prevent ketoacidosis for many years [1]

Diagnosis (see the '*Initial tests*' care point):

- Diagnostic criteria for the diagnosis of T1DM requires one of the following [1]:
  - Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL) (where fasting is for at least 8 hours).
  - 2-hour plasma glucose ≥11.1 mmol/L (200 mg/dL) during an OGTT performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.
  - In patients with classic symptoms of hyperglycaemic crisis or hyperglycaemia, a random plasma glucose of ≥11.1 mmol/L (200 mg/dL).
  - HBA1C of ≥6.5%
- A second diagnostic test is required to confirm the diagnosis, unless the [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).
  - Results are unequivocal [**R-GDG**].
- A diagnosis of T1DM should be considered if hyperglycaemia and/or osmotic symptoms (i.e. polyuria, polydipsia) persist in a patient suspected to have T2DM treated with non-insulin agents [2][**L2**].

MDT approach (see the '*Multidisciplinary approach*' care point in the '*Management*' page):

- All adults diagnosed with T1DM should be referred to a secondary/specialist diabetology service and receive care within an MDT, which includes the following [**R-GDG**]:
  - Physicians.
  - Nurses.
  - Diabetes educator.
  - Dieticians.
  - Podiatrists.
  - Clinical pharmacists if available.
  - Other professionals who may form part of the team may include:
    - Exercise therapists.
    - Mental health professionals (psychologists).
    - Ophthalmologists.

Management (see the '*Multidisciplinary approach*' care point in the '*Management*' page):

- The treatment approach includes [1]:
  - DSME.

- DSMS.
- MNT.
- Education on physical activity.
- Psychosocial care.
- Screening for complications and comorbidities.
- Preventive care services [1]:
  - Immunisation.
  - Referral for smoking cessation.
  - Podiatric, ophthalmological, and dental referrals.
- If any of the above are not available in the immediate care settings, refer the patient to the appropriate setting [**R-GDG**].

Insulin therapy (see the '*Insulin regimens*' care point in the '*Pharmacological management*' page):

- Treatment for T1DM consists of the following [1]:
  - Intensive insulin therapy consisting of MDI or CSII therapy, i.e. insulin pump [1][**L1, RGA1**]:
    - MDI should include three or more injections of prandial insulin per day and one or two injections of basal insulin [2][**L1**].
  - Match prandial insulin to carbohydrate intake, pre-meal BG, and expected physical activity [1][**L3, RGA2**].
  - Insulin analogues should be used for most patients, especially those at elevated risk of hypoglycaemia to reduce hypoglycaemia risk [1][**L1, RGA1**].
  - A sensor-augmented low-glucose threshold-suspend pump may be considered for patients with [1][**L2**]:
    - Frequent nocturnal hypoglycaemia.
    - Recurrent severe hypoglycaemia; and/or
    - Hypoglycaemia unawareness.

Treatment targets (see the '*Glycaemic targets and testing*' care point in the '*Pharmacological management*' page):

- The target BG and HBA1C levels for non-pregnant adults are as follows [1]:
  - Before meals:
    - 4.4-7.2 mmol/L (80-130 mg/dL).
  - Peak post-prandial:
    - <10.0 mmol/L (<180 mg/dL).
  - HBA_{1C}:
    - <7.0%.

References:

Please see the care map's Provenance.

4 Key recommendations of this care map -2

Quick info:

Treatment targets in the elderly (see the '*Glycaemic targets for elderly patients*' care point in the '*Pharmacological management*' page):

- In elderly patients who are cognitively and functionally intact and have significant life expectancy, consider setting treatment targets that are similar to those used in younger adults [6][**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.
- Hyperglycaemia leading to risk or symptoms of acute hyperglycaemic complications should be avoided in all patients [1][**L3, RGA2**].
- At a minimum, glycaemic goals should avoid acute complications of diabetes, including [1][**L2**]:
  - Dehydration.
  - Poor wound healing.

- Hyperglycaemic hyperosmolar coma.

- See the table in the *'Glycaemic targets and testing'* care point in the '*Pharmacological management*' page for blood glucose targets in specific patient groups.

Hypoglycaemia prevention and management (see the '*Hypoglycaemia prevention*' care point in the *'Additional considerations'* page):

- Patients at risk for hypoglycaemia should be asked about symptomatic and asymptomatic hypoglycaemia at each encounter [1] [**L2**].
- Patients should understand the situations that increase their risk of hypoglycaemia, such as [1][**L2**]:
  - Taking insulin without eating adequately.
  - Fasting (e.g. for tests or procedures or if fasting during Ramadan).
  - During or after intense exercise.
  - During sleep.
- Teaching patients how to balance their insulin use with their carbohydrate intake and exercise is required to reduce the risk of hypoglycaemia; however, this method is not always sufficient for prevention [1][**L2**].
- Those in close contact with hypoglycaemia-prone patients should be educated in the use of glucagon kits [1][**L2**].
- Elderly patients in long term care facilities are at increased risk of hypoglycaemia [1]:
  - Assess for hypoglycaemia at least every 30 days for the first 90 days after admission and then at least every 60 days thereafter [1][**L2**].
  - An alert strategy and protocol should be in place and the provider should be called in case of hypoglycaemia, hyperglycaemia, or if the patient is unwell [1,4].
- Ongoing assessment of cognitive function is suggested [1,4][**L2, RGA2**]:
  - If low or declining cognition is detected, the clinician, patient, and caregivers should pay increased attention to hypoglycaemia risk.
  - Education should cover how to properly use flexible insulin therapy using basal-bolus regimens.
  - If impaired hypoglycaemia awareness is ongoing, offer additional education with a focus on avoiding and treating hypoglycaemia.

References:

Please see the care map's Provenance.

5 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

Anti-TPO

Anti-thyroid peroxidase antibody

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
CSII
Continuous subcutaneous insulin infusion
DAFNE
Dose Adjustment For Normal Eating
DKA
Diabetic ketoacidosis
DSME
Diabetes self-management education
DSMS
Diabetes self-management support
eGFR
Estimated glomerular filtration rate
GADA
Glutamic acid decarboxylase antibodies
HAAF
Hypoglycaemia-associated autonomic failure
HBA_{1c}
Glycated haemoglobin
LDL-C
Low density lipoprotein-cholesterol
MDI
Multiple-dose insulin injections
MDT
Multidisciplinary team
MOPH
Ministry of Public Health of Qatar
MNT
Medical nutrition therapy
NPH
Neutral protamine Hagedorn
OGTT
Oral glucose tolerance test
PHQ
Patient health questionnaire
SSI
Sliding scale insulin
SMBG
Self-monitoring of blood glucose
T1DM
Type 1 diabetes mellitus
T2DM
Type 2 diabetes mellitus
TDD
Total daily dose
TSH
Thyroid stimulating hormone

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6 T1DM - clinical presentation

Quick info:

T1DM is typically diagnosed on the basis of clinical symptoms associated with insulin deficiency [1,2]:

- Polyuria.
- Polydipsia.
- Weight loss.
- Marked hyperglycaemia that is not responding to oral agents.
- Acute onset includes:
  - Classic symptoms of hyperglycaemia or hyperglycaemic crisis.
  - Random plasma glucose of ≥ 11.1 mmol/L (200 mg/dL).

Clinical presentation in adults:

- Typically has a more gradual onset than in children, with slower destruction of beta-cells [1,2].
- May initially appear consistent with T2DM, and differentiating between T1DM and T2DM may be challenging [2].
- Clinical clues suggestive of T1DM may include:
  - A lean individual with [2]:
    - Clinical symptoms of hyperglycaemia.
    - Without a first-degree relative with diabetes.
    - But often with a history of distant relatives with T1DM or other autoimmune disease.
    - NB: It should be noted that obesity does not rule out autoimmunity.
- Adults may retain sufficient beta-cell function to prevent ketoacidosis for many years [1].

Diagnose T1DM on clinical grounds in adults presenting with hyperglycaemia, whilst considering that patients will often have one or more of the following [4]:

- Ketosis.
- Rapid weight loss.
- BMI below 25 kg/m^2.
- Personal and/or family history of autoimmune disease.

References:

Please see the care map's Provenanace.

7 History

Quick info:

Take a comprehensive medical history, including [1][**L2**]:

- Age and features of onset of diabetes, e.g.:
  - DKA, asymptomatic laboratory finding etc.
- Eating patterns.
- Nutritional status.
- Weight history.
- Physical activity habits.
- Nutrition education and behavioural support history and needs.
- Presence of co-morbidities including psychosocial disorders and dental disease
- Screen for depression using the PHQ-2 (use the PHQ-9, if PHQ-2 is positive).
- History of smoking, alcohol consumption, substance use.
- History of diabetes education and self-management plans.
- Review of previous treatment regimens.
- Review of previous response to diabetic medications.
- Results of previous glucose monitoring.

- History of DKA:
  - Frequency.
  - Severity.
  - Cause.
- History of hypoglycaemic episodes:
  - Awareness.
  - Frequency.
  - Causes.
- History of hypertension.
- History of hypercholesterolaemia.
- Microvascular complications:
  - Retinopathy.
  - Nephropathy.
  - Neuropathy:
    - Sensory, including history of foot lesions.
    - Autonomic, including sexual dysfunction and gastroparesis.
- Macrovascular complications:
  - Coronary heart disease.
  - Cerebrovascular disease.
  - Peripheral arterial disease.

References:
Please see the care map's Provenance.

8 Examination

Quick info:

Conduct a general physical examination, noting in particular the following [1][**L2**]:

- Height, weight, and BMI.
- BP, including orthostatic BP, if indicated.
- Head and neck examination, including:
  - Thyroid enlargement.
- Skin stigmata (e.g. striae, acanthosis nigricans, hyperpigmentation, alopecia, or vitiligo).
- Comprehensive foot examination, including [**R-GDG**]:
  - Inspection for skin damage.
  - Palpation of dorsalis pedis and posterior tibialis pulses.
  - Absence or presence of patellar and Achilles tendon reflexes.
  - A full neurological examination including proprioception, vibration, and monofilament sensation.

References:
Please see the care map's Provenanace.

9 Complications and comorbidity assessment

Quick info:

Complications of T1DM include [1]:

- Diabetic kidney disease.
- Diabetic retinopathy.
- Neuropathy.
- Foot ulcers.

- Charcot foot.
- Foot amputations.

In elderly patients, screening for diabetes complications should [1]:

- Be individualised.
- Focus on complications that lead to functional impairment and/or can appear over short time period, e.g.:
  - Visual complications.
  - Lower-extremity complications.
- Include screening for [1,5]
  - Depression and treat if detected.
  - Cognitive dysfunction.
  - Functional status.
  - Fall risk.

Commonly associated conditions include [1,2].:

- ASCVD.
- Fatty liver disease.
- Fractures due to osteoporosis.
- Low serum levels of testosterone in men.
- Periodontal disease.
- Cognitive impairment in long-standing and poorly controlled T1DM.

Patients with autoimmune T1DM are also prone to other autoimmune disorders, such as [1]:

- Hashimoto’s thyroiditis.
- Coeliac disease.
- Graves’ disease.
- Addison’s disease.
- Vitiligo.
- Autoimmune hepatitis.
- Myasthenia gravis.
- Pernicious anaemia.

References:

Please see the care map's Provenanace.

10 Initial tests

Quick info:

Diagnostic criteria for the diagnosis of T1DM requires one of the following [1]:

- Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL) (where fasting is for at least 8 hours).
- 2-hour plasma glucose ≥11.1 mmol/L (200 mg/dL) during an OGTT performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water.
- In patients with classic symptoms of hyperglycaemic crisis or hyperglycaemia, a random plasma glucose 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 [6][L2].

N.B. [6,7]:

- A second diagnostic test is required to confirm the diagnosis, unless the [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).
- Results are unequivocal [R-GDG].

- If a second test is required, the same diagnostic test should be used with a new blood sample.
- If a patient has had inconsistent results from two diagnostic tests, the test result that is above the diagnostic threshold should be repeated without delay.
- 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.
- A diagnosis of T1DM should be considered if hyperglycaemia and/or osmotic symptoms (i.e. polyuria, polydipsia) persist in a patient suspected to have T2DM treated with non-insulin agents [2][L2].

References:

Please see the care map's Provenanace.

11 Further laboratory evaluation

Quick info:

Perform the following tests [1][**L2**]:

- HBA_{1C}:
  - If a result from the past 3 months is not available.
- If not performed in the last 12 months:
  - Fasting lipid profile.
  - Liver function tests.
  - Spot urinary ACR.
  - Serum creatinine and eGFR.
  - TSH:
    - If abnormal, consider testing for Anti-TPO.
- Screening for autoimmune markers:
  - Autoimmune markers of immune-mediated diabetes include [1,2]:
    - Islet cell autoantibodies.
    - Insulin autoantibodies.
    - GADA.
  - Autoantibody titres diminish as time passes from diagnosis [2].
  - The lowest false-positive rate is at the time of diagnosis, the rate of false positives increases thereafter [4]:
    - The false negative rate can be reduced by conducting two different tests.
- C-peptide levels measurement [2]:
  - A surrogate marker for insulin secretion.
  - Occasionally needed to confirm T1DM in a patient on insulin.
  - May be detected over 40 years after the initial diagnosis, irrespective of whether the diagnosis was made in childhood or adulthood.
  - The more time that has passed since diagnosis, the higher the discriminative value of C-peptide testing [4].

C-peptide and/or diabetes-specific autoantibody titres should [4]:

- Not be routinely used to confirm T1DM in adults.
- Should be considered if [4][**L2**]:
  - T1DM is suspected, but features are atypical, e.g.:
    - Patient is aged ≥50 years.

- BMI of ≥30 kg/m^2 [**R-GDG**].
- Slow evolution of hyperglycaemia.
- Long prodrome.

- If there is a clinical suspicion of a monogenic form of diabetes.
- The classification is uncertain, and confirmation of the diagnosis would alter the therapy.

References:

Please see the care map's Provenanace.

12 Consider referral to specialist services

Quick info:

If unavailable within the MDT, consider referral for the following speciality services after initial diagnosis [1][**L2**]:

- Ophthalmologist for dilated eye exam within 3 months of diagnosis and annual review thereafter.
- Diabetes educator for structured education and support.
- Registered dietician for MNT.
- Dental referral for a full dental and periodontal exam.
- Mental health professional (psychologist) if indicated.
- Family planning for women of reproductive age.

References:

Please see the care map's Provenanace.

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Type 1 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 1 diabetes mellitus in adults and the elderly

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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.

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Type 1 diabetes mellitus in adults and the elderly

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.

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