

# Diabetes properties

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## Plan

- Diabetes properties
- Selection of key properties for verification



## The diabetes protocol

- The diabetes protocol of NHG:
  - management of diabetes mellitus type 2
  - aspects of clinical practice: diagnosis & treatment and controls (management)

### **Property 2:** *Verification of correctness of a diagnosis or treatment or evaluation (management)*

- **Example - Correct doses:** When using 2 doses per day of insulin for diabetes treatment, our expert considers a good practice to distribute the morning and evening doses according to the 2/3-1/3.
- **Example – Correct diagnostic test:** the use of the oral glucose tolerance test (OGTT) is not recommended (in GP practice).

## **Property 2:** *Verification of correctness of a diagnosis or treatment or evaluation (management)*

- **Example – Correct evaluation:** Blood glucose levels below 3.5 mmol/l (fasting and postprandial) are hypoglycaemic and not good. It may be necessary to adjust the therapy. Fasting blood glucose values above 8 mmol/l and postprandial glucose levels above 10 mmol/l are hyperglycaemic and not good.
- **Example – Correct management:** patients on combination therapy: in the event of insufficient correction (postprandial values stay above 10 mmol/l and preprandial values stay inside target area) different insulin regimen must be considered. This should be discussed with an internal medicine specialist.

## **Property 3:** *Verification of safety of a diagnosis or treatment (management)*

- **Example - Safe doses increases:** In the Diabetes treatment, according to our expert, it is not advisable to increment drug/insulin doses too quickly unless the patient is in a critical situation. The idea is avoiding the negative effects of treatment overshoot, i.e. hypoglycaemia episodes. More precisely, the dose should be titrated (i.e. increased by the smallest amount) in intervals of at least 2 to 4 weeks, unless the blood glucose is that high (e.g. > 15 mmol/l) that a faster pace of dose titration is needed.
- **Example – Maximal duration of therapy:** If dietary measures and increased physical activity (diet and exercise therapy) have not been sufficient to reach the target blood glucose levels after 3 months, oral medication is needed.

#### **Property 4:** *Verification of safety of a combination of treatments*

##### **Example – Safe combination of treatments:**

the combined use of all three classes of oral medication (sulphonylurea derivative, metformin and acarbose) is not recommended and should be avoided.

#### **Property 5:** *Verification of different safety conditions*

- avoid non-desired situations by patients with complications caused by the disease: diabetic foot ulcer, retinopathy, nephropathy, hypo- and hyperglycaemia

OR

- avoid non-desired situations of drugs

### Property 5: *Verification of different safety conditions (cont.)*

**Example - Periodicity of controls in patients with complications:** In the Diabetes treatment, it is advisable to monitor patients with complications more often (correctness property). For example, individuals who have suffered a foot ulcer should have their feet inspected at least every 3 months.

**Example – Correct management in patients with diabetic foot ulcer:** diabetic foot ulcer that does not disappear within 2 weeks: referral to foot team or an internal medicine specialist, surgeon, vascular surgeon, orthopaedic surgeon or dermatologist with knowledge of diabetic foot.

### Property 5: *Verification of different safety conditions (cont.)*

**Example - Avoid non-desired situations in patients with complications:** In case of patients with existing retinopathy the lowering of blood glucose levels must be more gradual. Sudden reduction of high blood glucose levels gives deterioration in retinopathy.

**Example – Avoid non-desired situations in patients with complications:** In patients with hypoglycaemia using long acting sulphonylureas frequent monitoring of blood glucose levels is mandatory, because hypoglycaemia is likely to occur.

### **Property 5:** *Verification of different safety conditions (cont.)*

- **Example – Correct management for patients with hyperglycaemia:** In patients with hyperglycaemia accompanied by drowsiness, dehydration or vomiting secondary care specialist should be consulted. In the event of hyperglycaemic coma the patient must be referred to hospital.
- **Example – Correct management for patients with complications:** Patients with serum creatinine over 200  $\mu\text{mol/l}$  or clearance of  $< 30 \text{ ml/min}$  should be referred to an internal medicine specialist or nephrologist.

### **Property 6:** *Verification of correctness/safety properties about the management of a patient group*

- **Example – Safety of management:** patients with kidney or liver insufficiencies, hypoxia with heart and vascular diseases and heavy use of alcohol should not get metformin, because of possible lactic acidosis, which can be fatal.
- **Example – Safety of management:** Patients using insulin with conditions that are accompanied by fever, vomiting or diarrhoea must take plenty of fluid and temporarily increase therapy to prevent dehydration. Under no circumstances may insulin be discontinued or reduced. Careful control of blood glucose levels and fluid balance should be done in these patients.

**Property 7:** *Verification of correctness/safety properties about the management of related diseases (risk factors)*

- **Example - Safe treatments in patients with hypertension:** According to the expert, in the hypertension treatment of patients with diabetes it is not advisable to give beta-blockers to individuals who are unaware of hypoglycaemia (safety property). The reason is that beta blockers can make the patients (even more) unaware of hypoglycaemia.

**Property 7:** *Verification of correctness/safety properties about the management of related diseases (risk factors) (cont.)*

- **Example – Correct treatment in patients with overweight:** The oral drug of first choice for patients with overweight ( $BMI > 27$ ) is metformin (metformin treatment causes no increase in insulin level, so weight gain is less likely than with sulphonylurea derivatives or insulin).
- **Example – Correct management in patients with cardiovascular disease:** The target blood pressure should be  $\leq 150/85$  mmHg. This reduces the risk of micro vascular and macrovascular complications.

**Property 8:** *Verification of sequences of actions done by a physician*

Example: after being diagnosed as a type 1 or 2 diabetic, are sufficient data collected to choose a treatment. E.g. weight, ketone bodies in urine etc. After the data are available is the right therapy chosen.

**Property 9:** *Verification of correctness/safety properties expressed in terms of patterns of actions*

- **Example - Correct sequence of evaluation and treatment:** Combination therapy or insulin therapy alone: before beginning insulin use and each day until the optimal insulin regimen is established, perform a four-point a day blood glucose profile.



***Property 9: Verification of correctness/safety properties expressed in terms of patterns of actions (cont.)***

**Example – Correct sequence of actions:**

- Combination therapy: start by adding 8-12 units of NPH insulin before bedtime. Thereafter modify the dosage every 2-3 days by 2-4 units on the basis of the fasting blood glucose values. If it appears that more than 40 units of insulin will be needed to obtain fasting blood glucose values below 7.0 mmol/l or if a considerable degree of postprandial hyperglycaemia persists, stop the tablets and begin NPH insulin twice daily.
- Insulin therapy: start with 12 units of insulin before breakfast and 8 units of insulin before the evening meal. Thereafter modify the dosage every 2-3 days by 2-4 units on the basis of the fasting blood glucose values and the postprandial values, until the target values have been reached.

***Property 10: Verification of correctness/safety properties expressed in terms of indicators***

(the application of the protocol results in actions that comply with indicators of expected outcomes defined either in the protocol itself or by external sources.)

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Selection of key properties for verification

- Discussion on criteria for selection
- Selection