

8.0 Acute complications of diabetes

8.1 Recommendations

- Diabetic ketoacidosis should be managed standard protocols by trained acute medical staff in a supportive environment
- Patients using insulin or some glucose-lowering drugs (especially sulfonylureas) should be educated about the symptoms and treatment of hypoglycaemia. They need to carry rapidly absorbable carbohydrate with them at all times.
- For self-recognized hypoglycaemia, or hypoglycaemia recognized by a third person, people should take small amounts of rapidly absorbed carbohydrate; this should be followed by a normal meal
- Where conscious level is impaired by hypoglycaemia so the patient is unable to swallow, glucagon or intravenous glucose may be given; this is followed by oral intake once recovery has occurred
- Glucagon should be provided to those at risk of severe hypoglycaemia (children with Type 1 diabetes; those with a history of severe hypoglycaemia), but training must be given to relatives/carers on how to use it.

8.2 Diabetic ketoacidosis (DKA)

Diabetic ketoacidosis mainly affects people with type 1 diabetes and is less frequent in type 2 diabetes. It occurs when the body breaks down fatty acids and produces ketones through insulin lack.

Major precipitating factors include infection, other acute illnesses, and omission of or insufficient insulin intake. With proper instruction on monitoring of blood glucose and urine ketones, insulin dose adjustment and maintenance of fluid intake, many cases of diabetic ketoacidosis can be prevented. All cases of established diabetic ketoacidosis will need hospitalization. Hospital physicians should ensure that their staff are competent in recognition and management of these patients by guidelines readily available in acute medical units, and through regular educational sessions, and with each new intake of medical staff. The details of management of DKA in terms of the basic need for insulin, water and salt replacement therapy, and correction of potassium deficit, together with and special treatments such as alkali, CVP monitoring, use of nasogastric tube and other matters are fully detailed in standard medical texts and are outside the scope of the current guideline. Ideally, patients with DKA should be cared for in intensive or high dependency units in the first 24-48 hours. Diabetes care teams should be involved as soon as possible.

8.3 Hypoglycaemia

Hypoglycaemia in people with diabetes is an abnormally low concentration of blood glucose due to some oral glucose-lowering agents or insulin, in combination with insufficient food intake or unusual exercise. Hypoglycaemia may recur once treated, and with some sulfonylureas may be prolonged.

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8.4 Care of people with diabetes in hospitals

8.4.1 Rationale

There is an increase in the number of people with diabetes in the hospital. The prevalence of diabetes among hospitalized adults Libyan population is 18.8%. Furthermore, for every two patients hospitalized with known diabetes, there may be additional one with newly observed hyperglycaemia.

The management of diabetes in the hospital is as important as the management of the condition that prompted admission. Appropriate treatment of hyperglycaemia results in reduced mortality and morbidity. Observational studies have associated hyperglycaemia (new hyperglycaemia and known) with adverse outcomes during hospitalization. These include increased hospital mortality, length of stay and postoperative infections (2-5). Observational data have also shown a consistent, almost linear, relationship between blood glucose levels in hospitalized patients and adverse clinical outcomes, even in patients without established diabetes. However, outcomes of interventional studies that attempted to decrease such complications by aggressively treating hyperglycaemia are variable. Though evidence supports reduction of blood glucose to a better outcome, too aggressive lowering of blood glucose may be harmful.

Surgery and anaesthesia can induce hormonal and inflammatory stressors that increase the risk of complications in patients with diabetes. Elevated blood glucose levels are associated with worse outcomes in surgical patients, even among those not diagnosed with diabetes.

8.4.2 Recommendations

8.4.2.1 Glycaemic control on general wards

Glucose control targets for in-patients with diabetes should be 100-140 mg/dl in the fasting or pre-meal state with random readings being lower than 180 mg/dl.

Oral glucose-lowering drugs may be used if the patient is not critically ill, their condition is well controlled and he/she is expected to eat normally if glycaemic control was satisfactory on these oral agents prior to admission. Care should be exercised for developing contraindications.

Insulin therapy:

- Insulin is a useful form of treatment for in-patients because the dose can be titrated rapidly and it does not have a dose ceiling
- Calculation of insulin requirements is based on the dose before hospitalization (if the glucose level is acceptable on admission) or on insulin requirements during continuous insulin infusion, once requirements are stable
- If the insulin dose was not known, weight based estimation of the dose (0.4–1.0 U/kg) is reasonable with adequate nutritional intake
- Start with a low dose and titrate the dose up rapidly to meet demonstrated needs, with addition of correction doses meanwhile
- Scheduled insulin therapy if indicated would consist of basal insulin given as intermediate or long acting insulin (representing 50% of total insulin requirement) and prandial insulin representing 50% of the total dose divided between the three main meals given as rapidly acting insulin or regular insulin given 10-30 min prior to each meal.
- Correction insulin doses are given as regular insulin every 6 h for blood glucose levels higher than 180 mg/dl. The actual dose will depend on the presumed insulin sensitivity. It may be combined with the prandial insulin to compensate for pre-meal hyperglycaemia.
- Sliding scales are not recommended to treat hyperglycaemia in hospitalized patients.
- In type 1 diabetes patients who are not eating, basal and correction insulin should be continued as indicated above, while prandial insulin is withheld.

8.4.2.2 Glycaemic control in the critical care setting

Glycaemic targets:

- Blood glucose level should be maintained between 140 and 180 mg/dl.

Intravenous insulin infusion should be used to control hyperglycaemia:

- Initial hourly requirements can be estimated from 50% of the ambulatory daily insulin dose or based on patient weight (0.02 U/kg/h) or initiate the infusion at 1 U/h
- The rate is to be adjusted as needed to maintain target:

- Blood glucose determinations should be performed hourly until stability of blood glucose level has been demonstrated for 6–8 h; then, the frequency of blood glucose testing can be reduced to every 2–3 h.
- If concomitant infusion of dextrose is used, attention must be paid to the effects of abrupt changes in the dextrose infusion rate.

Transition to subcutaneous insulin therapy when the patient starts eating regular meals or is transferred to lower-intensity care:

- 75–80% of the total daily IV infusion dose is proportionately divided into basal and prandial components as discussed above
- To prevent hyperglycaemia, subcutaneously administered insulin must be given before discontinuation of IV insulin therapy (1–2 h with short- or rapid-acting insulin SC and 2–3 h with NPH or long-acting insulin).

8.4.2.3 Peri-operative glycaemic control

Principles of peri-operative control:

- Pre-operative assessment is important to determine risk status and optimal management to avoid clinically significant hyper- or hypo-glycaemia. While people with type 1 diabetes should receive insulin replacement at all times regardless of nutritional status, those with type 2 diabetes may need to stop oral medications prior to surgery and might require insulin therapy to maintain blood glucose control
- The glycaemic target in the peri-operative period needs to be clearly communicated so that proper insulin replacement, consisting of basal (long-acting), prandial (rapid-acting), and supplemental (rapid-acting) insulin can be implemented for optimal glycaemic control.
- The postoperative transition to subcutaneous insulin, if needed, can begin 12 to 24 h before discontinuing intravenous insulin, by re-initiation of basal insulin replacement. Basal/bolus insulin regimens are safer and more effective in hospitalized patients than supplemental-scale regular insulin.
- Postoperative nutrition-related insulin doses will vary depends on nutritional type (parenteral or enteral), but ideally all regimens should incorporate a basal/bolus approach to insulin replacement.

Practical Issues of peri-operative control

- The peri-operative glycaemic target in critically ill patients is 140 to 180 mg/dl. Evidence for a target in patients who are not critically ill is less robust, though fasting levels less than 140 mg/dl and random levels less than 180 mg/dl are appropriate.
- For patients with insulin deficiency basal coverage should be administered on the night before surgery to assure optimum fasting blood glucose for the operative room. Correction doses may be applied on the morning of surgery if the morning glucose concentration exceeds 180 mg/dl.

- If the basal insulin is normally administered in the morning, the morning basal insulin without dose adjustment in type 1 people with diabetes whereas 50–100% of the basal insulin may be administered on the morning of surgery for type 2 patients.
- Intravenous insulin infusion should be started prior to the procedure with blood glucose monitoring (hourly) and dose adjustments.
- For minor, short procedures, the preoperative glucose management orders may be continued.

8.5 Care for people with diabetes in emergency departments

Several studies suggest that individuals with diabetes are significantly more likely to use the emergency department than their non-diabetic counterparts. A substantial number of visits are for non-urgent problems, self-reported diagnosis of other co-morbidities, and to assess presence or absence of diabetes-related complications. Diabetes care is complex and requires that many issues, beyond glycaemic control, be addressed.

Formulating evaluation and management plans provide a basis for medical care for old and newly diagnosed diabetics. If the diagnosis of diabetes has already been made, the evaluation should review the previous treatment, and the past and present status of glycaemic control. Laboratory tests appropriate to the evaluation of each patient's general medical condition should be performed.