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National Diabetes Services Scheme

An Australian Government Initiative

Diabetes in hospital

Healthcare providers' guide to Diabetes Management for Inpatients

NDSS Helpline 1800 637 700
ndss.com.au

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 **diabetes
australia**

The NDSS is administered by Diabetes Australia

Why is optimal diabetes management in hospital important?

Diabetes is a frequent co-morbidity amongst hospital inpatients. Up to 40% of hospital inpatients may have diabetes. It is common for blood glucose levels to become unstable when a patient is in hospital. Significantly, high blood glucose levels in hospital have been associated with higher infection rates, poorer wound healing and increased mortality.

People with diabetes are occasionally admitted to hospital to manage their blood glucose levels or for acute diabetes complications such as diabetic ketoacidosis.

More often people with diabetes are admitted for management of chronic diabetes complications such as diabetic foot ulcers, chronic kidney disease, cerebrovascular events or cardiac disease. Diabetes can also be a significant co-morbidity in patients admitted for other unrelated conditions or for elective surgery, other investigating procedures and maternity care. People with diabetes have longer lengths of hospital stay, averaging about two days longer than people without diabetes.



The fact that people with diabetes have longer hospital lengths of stay indicates that suboptimal glucose levels may be a significant problem in hospital. The Australian Institute of Health and Welfare estimated that the cost of diabetes to hospital services in 2008-9 was \$649M, almost doubling the figure from 2004-2005. There were over 1 million hospitalisations associated with diabetes in 2016-17. Studies have demonstrated that hospital lengths of stay are reduced when diabetes is promptly and appropriately managed.

Many new cases of diabetes are first detected in hospital following routine testing. It is important to ensure that people with newly diagnosed diabetes are appropriately managed, not just in hospital, but even after discharge. In particular, we need to ensure that people with diabetes have the opportunity to participate in self-management, and acquire appropriate self-management skills. People newly diagnosed with diabetes should also be encouraged and assisted to register with the NDSS. Their GP should be made aware of the diagnosis and involved in the management plan following discharge from hospital.

Appropriate management of hyperglycaemia in hospitalised patients can improve hospital and long-term clinical outcomes.

Hyperglycaemia as an inpatient, may be due to

- pre-existing known diabetes
- pre-existing undiagnosed diabetes
- a consequence of acute illness (stress hyperglycaemia)
- a consequence of medical interventions (e.g. medications such as steroids, feeding regimens, surgical procedures)
- prescribing errors or withholding insulin.

How is hyperglycaemia in hospital best managed?

Dietary management is important and consultation with a dietitian may be required, especially if there is variable intake, nausea, or the patient is in a catabolic state (a state of muscle and/or fat breakdown leading to weight loss).

Exercise/activity is usually not an option for management of hospital patients.

Oral and non-insulin injectable glucose

lowering agents – the continued use of these agents in hospitalised patients should be reviewed on an ongoing basis during their admission. The safety of using these agents can be compromised by changing situations such as variable oral intake, hydration status, new co-morbidities, administration of iodine contrast and altered renal and hepatic function. In particular SGLT-2 inhibitors have been associated with ketoacidosis, and should be ceased if there are periods of low oral intake or fasting, including prior to surgery and their use reviewed during critical illness.

Insulin – allows for dose adjustment. The patient's usual insulin regimen may be continued but dose adjustments, and/or supplemental correctional insulin may be needed. In some patients, insulin may be introduced for the first time during hospitalisation. Insulin may also be given as an intravenous infusion with glucose when the patient is 'Nil by mouth'.

When charting insulin, consider the following:

- if the person is insulin naïve or not,
- basal insulin, usually long acting, scheduled once or twice daily as appropriate
- mealtime, supplemental or correction insulin usually rapid/short acting "top- up" insulin is scheduled for mealtimes or at regular pre-specified intervals to maintain appropriate blood glucose levels. Supplemental insulin should only be used as part of an insulin regimen which is frequently reviewed and titrated (ideally daily).

Oral and non-insulin injectable glucose lowering agents or pre mixed insulin may be used in certain stable patients eating regularly. Supplemental insulin may be prescribed for these patients, but if needed frequently, regular background insulin doses should be prescribed or premixed insulin be adjusted. When supplemental insulin is used in isolation, it may result in more erratic blood glucose levels.

Insulin is a frequent source of prescribing errors so care must be taken in its prescription and administration.

Local protocols and guidelines – your hospital may have these for the care of people with diabetes. Consult them when you are unsure!

Glucose targets in hospital

- These should be individualised according to the age, type of diabetes (e.g. diabetes in pregnancy) and co-morbidities of the patient. Less intensive blood glucose level targets are set for elderly patients or those with multiple comorbidities.
- Most patients in general hospital wards with hyperglycaemia should be treated to achieve and maintain blood glucose levels between 5-10 mmol/L.
- Be aware that aiming for tight glucose management may increase the risk of hypoglycaemia. Frequent blood glucose monitoring helps detect and prevent this.
- When glucose levels are below 4 mmol/L, hypoglycaemia treatment should be given.
- Blood glucose levels >10 mmol/L indicate need for more frequent glucose monitoring and the need to review and modify diabetes management while in hospital.

Changes in oral intake

- Diabetes therapy usually needs to be changed when there is a major change in the patient's oral intake. When a patient is fasting or is 'Nil by mouth', an insulin/glucose infusion may need to be commenced. The insulin/ glucose infusion should not be ceased until the patient is eating and drinking normally. Insulin should not be withheld in a patient with type 1 diabetes.
- Additional care will also be needed for people with diabetes commenced on Total Parenteral Nutrition (TPN) or enteral feeds. Management of people with diabetes on TPN or enteral feeds is complex and involvement of the diabetes team in their care during their hospital stay is recommended. Close liaison with the dietitian or team managing the enteral or parenteral nutrition is critical.

- When patients resume oral intake, it is important to plan a smooth transition to usual treatment, whether the patient has been on an insulin/glucose infusion, enteral feeding, or TPN. It is vital that appropriate changes are made to the patient's insulin doses if they continue to need insulin therapy.
- Notify the Diabetes Team in advance if a patient is due to cease TPN, so the prescribed insulin can be appropriately adjusted and the risk of unstable blood glucose levels is then minimised.

Blood glucose monitoring in hospital

For all patients with diabetes or newly detected hyperglycaemia, regular point of care blood glucose level monitoring using hospital or the patients' own glucose meters should be performed as per hospital policies and protocols. This may include pre- and post- prandial monitoring, and, occasionally, before bed or overnight. Pre-meal monitoring needs to be taken as close as possible to the meal particularly if insulin doses are being calculated. Post meal monitoring is typically performed 2 hours after meals. Regular, more frequent monitoring is particularly required in patients medically unstable or have altered nutritional intake.

Daily review of the patient's blood glucose levels is recommended during the inpatient stay.

For inpatient management, regular monitoring with glucose meters should be continued as per existing hospital protocols, even in patients using continuous glucose monitoring or flash glucose monitoring devices. Management decisions prompted by continuous or flash glucose monitoring readings should always be confirmed by a finger-prick blood glucose measurement.

Blood glucose monitoring:

- alerts staff and patients to episodes of hyper or hypoglycaemia
- guides diabetes therapy adjustments where a patient is known to have diabetes, if hyperglycaemia or hypoglycaemia has been detected
- assists where hospital therapies (e.g. glucocorticoids or octreotide, or feeding regimens such as Total Parenteral Nutrition, or enteral feeds) will potentially exacerbate hyperglycaemia
- for patients with longer hospital stays, once acceptable blood glucose levels have been achieved, the frequency of testing may be reduced.

Personal insulin pumps

In general, Insulin Pump Therapy (IPT) can be continued in hospital when the patient is able to competently and safely self-manage the pump in line with hospital policies and protocols. Patients on insulin pump therapy should be referred to the Inpatient Diabetes Team for further management advice.

Diabetes and end of life situations

- Palliative care patients may still benefit from maintaining blood glucose levels whilst in hospital, ensuring the patient is asymptomatic. Therefore, diabetes treatment remains relevant in these patients.
- The level of intervention would generally be less intensive than for other hospital patients, and needs to be individualised, depending on the phase of end of life and other situational factors.



Key Recommendations and Practice Points

- Aim to achieve a blood glucose level less than 10 mmol/L for most patients but avoid reducing below 5 mmol/L. Check blood glucose levels frequently. Target blood glucose levels should be individualised.
- Hypoglycaemia (blood glucose level <4 mmol/L) should be treated in accordance with your hospital hypoglycaemia protocol.
- Individualised nutritional plans should be provided as insulin therapy will depend on the nature of the feeding cycle.
- Supplemental insulin should not be used alone to optimise blood glucose levels, including in those patients receiving enteral or parenteral nutrition.
- Insulin therapy may include regular basal and/or prandial and supplemental insulin (intermediate or long acting insulin).
- Patients with unstable blood glucose levels, variable parenteral feeding or those fasting may benefit from intravenous insulin infusion therapy.
- Contact your diabetes educator or Diabetes Team for advice and support.

- elevated HbA1c
- unstable glucose levels
 - blood glucose levels >10.0 mmol/L and not improving
 - patient has recurrent hypoglycaemia
- new or altered diabetes treatment.

Improving glycaemic management has been shown to reduce the adverse outcomes associated with hyperglycaemia.

The Specialist Inpatient Diabetes Management Team is a recent concept. Involvement of such teams has demonstrated improved patient outcomes. The Specialist Inpatient Diabetes Management Team consists of a credentialed diabetes educator (CDE) and endocrinologist, or a physician with expertise in diabetes, who review inpatient diabetes management on a daily basis if needed.

The role of the team also includes improving diabetes management expertise throughout the hospital, the development and implementation of diabetes management protocols, direct management of diabetes with specific referral criteria, ward liaison, troubleshooting, and management advice.

Input from the extended diabetes team may also be required and sought during the patient's admission. The extended diabetes team may also include a nurse practitioner, dietitian, podiatrist, psychologist, physiotherapist, exercise physiologist, and social worker.

How can the Diabetes Team support you and your patient?

The Diabetes Team, where available, can assist in guiding ward management and transitioning of the patient to an ambulatory setting.

Consult the team early when:

- patient has Type 1 diabetes
- patient is on insulin pump therapy
- patient is pregnant and has elevated blood glucose levels for pregnancy
- new diagnosis of diabetes
- patient's ability to self-manage their diabetes has been altered



Where can I get further information?

Improving health outcomes for people with diabetes across Australia is the objective of the National Diabetes Services Scheme (NDSS). Diabetes may be undiagnosed but still impact upon hospital episodes of care, and the following guidelines were developed in response to identified issues.

Australian Diabetes Society Guidelines for Routine Glucose Control in Hospital 2012

Provide support for hospital staff who are not diabetes specialists, in the management of diabetes in hospital, and aim for a level of national consistency.

[diabetessociety.com.au/documents/](http://diabetessociety.com.au/documents/ADSGuidelinesforRoutineGlucoseControlinHospitalFinal2012.pdf)

[ADSGuidelinesforRoutineGlucoseControlinHospitalFinal2012.pdf](http://diabetessociety.com.au/documents/ADSGuidelinesforRoutineGlucoseControlinHospitalFinal2012.pdf)

In addition, the Living Evidence Guidelines in Diabetes Working group is in the process of developing “In hospital glycaemic control” guidelines.

Australian Diabetes Society Peri-operative Diabetes Management Guidelines 2012

These guidelines were developed to provide assistance for those practitioners whose primary focus is not diabetes, in their management of patients with diabetes undergoing surgical procedures.

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For more information: talk to the doctors or nurses looking after you, your General Practitioner, Diabetes Educator, or Endocrinologist.

ⁱ Australian Institute of Health and Welfare Diabetes web report. Hospital care for diabetes aihw.gov.au/reports/diabetes/diabetes/contents/hospital-care-for-diabetes. 30 August 2019.