Safer inpatient glucose targets: New guidelines for managing diabetes during hospital admissions for antenatal steroids, labour and birth

Recent guidelines from the Joint British Diabetes Societies for Inpatient Care (JBDS-IP) offer practical, person-centred options to safely manage glucose levels in pregnant women with diabetes during hospital admissions for antenatal steroid administration, labour and birth (Dashora et al, 2022). They provide updated recommendations on the safe administration of insulin by multidisciplinary healthcare professionals to minimise the risk of maternal hypoglycaemia during inpatient care. They also aim to provide greater support for pregnant women who choose to self-manage their diabetes using continuous glucose monitoring (CGM) systems and continuous subcutaneous insulin infusion pumps. Involving women as experts in their own diabetes management and active partners during inpatient admissions may also reduce the burden of intensive diabetes management in maternity care settings.

Previous JBDS-IP and NICE guidelines recommended aiming for capillary glucose levels between 4.0 and 7.0 mmol/L before and during birth (Dashora et al, 2018; NICE, 2015). However, recent studies confirm that it is sustained maternal hyperglycaemia during pregnancy that is associated with neonatal hypoglycaemia, which calls into question the risks and benefits of a short duration of strict glucose levels during birth (Yamamoto et al, 2020). Achieving strict glucose targets in hospital settings without maternal hypoglycaemia is particularly challenging for pregnant women with type 1 diabetes. Hypoglycaemia is a common occurrence, both during and after variable-rate intravenous insulin infusion (VRIII), affecting approximately one in two pregnant women in maternity care settings. The obstetric and midwifery staff administering complex insulin regimens in labour and delivery units may have limited diabetes training, so the potential for neonatal benefit must also be balanced against the risk of maternal hypoglycaemia.

We don't know whether or not tight intrapartum glucose levels reduce the risk of neonatal hypoglycaemia in current clinical practice. We do know that rates of neonatal hypoglycaemia are highest in type 1 diabetes, where it is strongly associated with maternal hyperglycaemia throughout the second and third trimesters (Yamamoto et al, 2019). We also know that the key contributing factors to neonatal hypoglycaemia are preterm birth and large-for-gestational-age birthweight. These are both associated with prolonged gestational hyperglycaemia and are unlikely to be impacted by acute intrapartum glucose levels. During the CONCEPTT trial, we found no differences in the intrapartum glucose levels between mothers with and without neonatal hypoglycaemia (Yamamoto et al, 2019).

The updated JBDS-IP guidelines, therefore, propose that pregnant women with diabetes, especially those with type 1 diabetes, be offered a safer target glucose range of 5.0–8.0 mmol/L during hospital inpatient admissions (Dashora et al, 2022). This is intended to provide a safe buffer zone, allowing time to act and hopefully prevent maternal hypoglycaemia episodes. The stricter, conventional target glucose range of 4.0–7.0 mmol/L may be safer and more applicable for women with lower risk of hypoglycaemia; for example, those with gestational diabetes (GDM) or type 2 diabetes who are managed by diet and/or metformin rather than insulin.

The safety and efficacy of VRIII use following antenatal corticosteroids in obstetric ward/delivery unit settings are also uncertain. The JBDS-IP guidelines support women's choices to continue diabetes self-management or to use VRIII during hospital admissions for corticosteroids, with a safer target glucose range of 5.0–8.0 mmol/L proposed to minimise the burden of maternal hypoglycaemia, especially in type 1 diabetes. There is no doubt

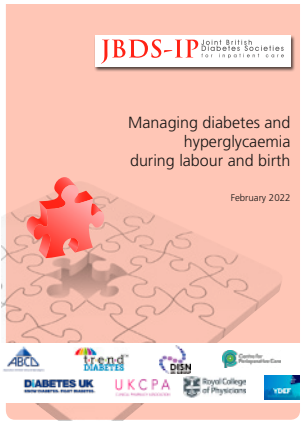
Caroline Byrne
Cambridge University Hospitals NHS Foundation Trust

Helen R Murphy
Cambridge University Hospitals and Norfolk and Norwich University Hospitals NHS Foundation Trusts and University of East Anglia

Citation: Byrne C, Murphy HR (2022) Safer inpatient glucose targets: New guidelines for managing diabetes during hospital admissions for antenatal steroids, labour and birth. *Journal of Diabetes Nursing* **26**: JDN232

Box. Summary of the updated JBDS-IP guidelines.

- The safer inpatient glucose target zone of 5–8 mmol/L allows pregnant women more flexibility to self-manage their diabetes, which may:
  - ⇩ Risk of maternal hypoglycaemia.
  - ⇩ Staff burden.
  - ⇩ Medicalised birth.
  - ⇧ Support personalised inpatient care/women's empowerment in diabetes management.
  - ⇧ Mobility in labour.
- A personalised diabetes management plan for delivery (± steroids) should be **agreed jointly with women, their birth partners and specialist teams** and clearly documented from ~32–34 weeks' gestation.
- Variable-rate intravenous insulin infusion (VRIII) is available as a safety net if glucose levels are persistently above or below the 5–8 mmol/L target zone, or if women are unable to or chose not to continue self-management.
- Basal insulin and/or insulin pump therapy can continue alongside VRIII, but hybrid closed-loop systems should be switched off and capillary glucose levels (rather than continuous glucose monitoring) should be used for adjustment of VRIII.



Click here to view the guideline

about the benefits of steroids for reducing neonatal respiratory complications before 34 weeks' gestation. However, the use of steroids is more controversial after 34–36 weeks' gestation, where careful balancing of risks and benefits is needed (Smith et al, 2017). After 36 weeks, activation of fetal brain glucocorticoid receptors may outweigh the potential neonatal respiratory benefits.

Data regarding use of antenatal steroids in women with diabetes are limited. During the CONCEPTT trial, approximately 25% of pregnant women with type 1 diabetes had corticosteroids, and most continued diabetes self-management during their antenatal admission. We found low rates of neonatal respiratory morbidity (5–10%) with no clear evidence of short-term benefits or harms (Feig et al, 2017). A larger New Zealand study in a multi-ethnic pregnant population (65% GDM, 21% type 2 diabetes, 13% type 1 diabetes) found that approximately 9% of mothers with diabetes were admitted for antenatal corticosteroids (Tuohy et al, 2021). Almost all had glucose levels above 7.0 mmol/L, and half experienced substantial hyperglycaemia, with glucose excursions above 10.0 mmol/L, in the three days after corticosteroids. Most studies have found comparable hyperglycaemia rates despite increasing maternal insulin doses by around 50%, regardless of insulin delivery method. This is accompanied by high rates of maternal hypoglycaemia, up to ~50%, in mothers with type 1 diabetes.

Pregnant women with type 1 diabetes are increasingly using real-time or intermittently scanned CGM, alone or in conjunction with insulin pumps or hybrid closed-loop systems, and they may prefer to continue these during inpatient admissions for steroids, labour and birth. These new tools may empower more effective diabetes self-management and help to reduce maternal hypoglycaemia. However, some pregnant women report poor experiences, suggesting that healthcare professionals may have outdated knowledge of insulin pumps, for example insisting that pumps be removed during delivery or on checking hourly capillary blood glucose levels even when they have access to extensive CGM data. The updated JBDS-IP guidelines, therefore, support increased use of diabetes technology. However, they emphasise that, while CGM can be used to guide diabetes self-management, it **should not be used** to guide VRIII doses. When VRIII is used, the guideline also recommends careful attention to fluid balance, using 0.9% saline with 5% dextrose and 0.15% potassium chloride to minimise the risk of maternal hyponatraemia. ■

Dashora U, Murphy HR, Temple RC et al; Joint British Diabetes Societies for Inpatient Care (2018) Managing hyperglycaemia during antenatal steroid administration, labour and birth in pregnant women with diabetes. *Diabet Med* **35**: 1005–10

Dashora U, Levy N, Dhatariya K et al; Joint British Diabetes Societies In Patient group (2022) Managing hyperglycaemia during antenatal steroid administration, labour and birth in pregnant women with diabetes – an updated guideline from the Joint British Diabetes Society for Inpatient Care. *Diabet Med* **39**: e14744

Feig DS, Donovan LE, Corcoy R et al; CONCEPTT Collaborative Group (2017) Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. *Lancet* **390**: 2347–59

NICE (2015) *Diabetes in pregnancy: management from preconception to the postnatal period* [NG3]. Updated Dec 2020. NICE, London. Available at: www.nice.org.uk/guidance/ng3 (accessed 25.02.22)

Smith GC, Rowitch D, Mol BW (2017) The role of prenatal steroids at 34–36 weeks of gestation. *Arch Dis Child Fetal Neonatal Ed* **102**: F284–5

Tuohy JF, Bloomfield FH, Crowther CA, Harding JE (2021) Maternal and neonatal glycaemic control after antenatal corticosteroid administration in women with diabetes in pregnancy: a retrospective cohort study. *PLoS One* **16**: e0246175

Yamamoto JM, Corcoy R, Donovan LE et al; CONCEPTT Collaborative Group (2019) Maternal glycaemic control and risk of neonatal hypoglycaemia in type 1 diabetes pregnancy: a secondary analysis of the CONCEPTT trial. *Diabet Med* **36**: 1046–53

Yamamoto JM, Donovan LE, Mohammad K, Wood SL (2020) Severe neonatal hypoglycaemia and intrapartum glycaemic control in pregnancies complicated by type 1, type 2 and gestational diabetes. *Diabet Med* **37**: 138–46