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POSITION STATEMENT

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

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Abstract

This article summarises the Joint British Diabetes Societies for Inpatient Care guidelines on the management of glycaemia in pregnant women with diabetes on obstetric wards and delivery units, Joint British Diabetes Societies (JBDS) for Inpatient Care Group, ABCD (Diabetes Care) Ltd. The updated guideline offers two approaches – the traditional approach with tight glycaemic targets (4.0–7.0 mmol/L) and an updated pragmatic approach (5.0–8.0 mmol/L) to reduce the risk of maternal hypoglycaemia whilst maintaining safe glycaemia. This is particularly relevant for women with type 1 diabetes who are increasingly using Continuous Glucose Monitoring (CGM) and Continuous Subcutaneous Insulin Infusion (CSII) during pregnancy. All women with diabetes should have a documented delivery plan agreed during antenatal clinic appointments. Hyperglycaemia following steroid administration can be managed either by increasing basal and prandial insulin doses, typically by 50% to 80%, or by adding a variable rate of intravenous insulin infusion (VRIII). Glucose levels, either capillary blood glucose or CGM glucose levels, should be measured at least hourly from the onset of established labour, artificial rupture of membranes or admission for elective caesarean section. If intrapartum glucose levels are higher than 7.0 or 8.0 mmol/L on two consecutive occasions, VRIII is recommended. Hourly capillary blood glucose rather than CGM glucose measurements should be used to adjust VRIII. The recommended substrate fluid to be administered alongside a VRIII is 0.9% sodium chloride solution with 5% glucose and 0.15% potassium chloride (KCl) (20 mmol/L) or 0.3% KCl (40 mmol/L) at 50 ml/hr. Both the VRIII and CSII rates should be reduced by at least 50% after delivery.

1 | INTRODUCTION

The incidence of gestational diabetes and pregnancies complicated by type 1 or type 2 diabetes doubled during 1996–2010, with diabetes now affecting one in ten pregnant women by the age of thirty.[1] There is overwhelming evidence that sustained maternal hyperglycaemia during pregnancy is associated with many obstetric and neonatal complications including preterm births, large for gestational age and neonatal hypoglycaemia. There is more uncertainty regarding the impact of acute hyperglycaemia exposure during and following corticosteroid administration or during labour and birth on the risk of neonatal hypoglycaemia. This updated guideline from the Joint British Diabetes Societies for Inpatient Care (JBDS) is designed to offer practical, consistent, person-centred options to safely manage glucose levels in pregnant women with diabetes during antenatal steroid administration, labour and birth. The guidelines aim to support pregnant women with diabetes to achieve optimal intrapartum glycaemia without compromising maternal safety. The full JBDS guideline has an audit section that aims to collect data on maternal and neonatal outcomes to inform future clinical practice.

The 2015 National Institute for Health and Care Excellence (NICE) guideline recommended aiming for capillary glucose levels within a tight range of 4.0–7.0 mmol/L during labour and birth to reduce the incidence of neonatal hypoglycaemia.[2] Recent evidence questions the benefits of tight intrapartum glucose targets, due to the increased risk of maternal hypoglycaemia and uncertain benefit on neonatal hypoglycaemia.[3–5] Newer studies suggest that neonatal hypoglycaemia is strongly associated with sustained maternal hyperglycaemia during the second and third trimesters, as well as obstetric and neonatal factors including preterm birth and large for gestational age, which is unlikely to be impacted by acute intrapartum hyperglycaemia. Consequently, tight glycaemic control during labour may not reverse fetal hyperinsulinemia and its consequences. Therefore, some pregnant women with diabetes, anaesthetists, diabetes teams and obstetric units may consider that a pragmatic target range of 5.0–8.0 mmol/L is safer, as there is a safety 'buffer zone' between the lowest acceptable glucose limit and hypoglycaemia (See Appendix 1 and 3 of the updated JBDS guideline). The General Medical Council (GMC) advocates involving patients in shared decision making after 'meaningful discussion'. This updated JBDS guideline, therefore, includes both options; tight glycaemic targets of 4.0–7.0 mmol/L as recommended previously by JBDS and NICE, or a pragmatic target range of 5.0–8.0 mmol/L to reduce the risk of maternal hypoglycaemia and whilst maintaining safe glycaemia. Table 1 highlights the advantages and potential disadvantages of both approaches.

Novelty statement:

- The goals of diabetes management during the peripartum period include minimising the risks and consequences of maternal hyperglycaemia and neonatal hypoglycaemia, fluid overload and maternal and neonatal hyponatraemia
- This guideline offers two approaches – the traditional approach with tight glycaemic targets (4.0–7.0 mmol/L) and an updated pragmatic approach (5.0–8.0 mmol/L) to reduce the risk of maternal hypoglycaemia whilst maintaining safe glycaemia
- This updated pragmatic approach empowers women to self-manage their diabetes which may reduce the use of variable rate intravenous insulin infusion and reduce resource burden on delivery units
- Continuous glucose monitoring (CGM) and continuous subcutaneous insulin infusion (CSII) pumps are increasingly used before and during pregnancy and delivery. Placing insulin pumps clear of diathermy pads, and careful documentation of insulin doses may empower more women to continue diabetes self-management before, during and postpartum

A variable-rate intravenous insulin infusion (VRIII) that is adjusted according to hourly capillary blood glucose and a co-administered continuous intravenous infusion of glucose is widely used on medical and surgical wards.[6] This can be adapted for use on obstetric wards and delivery units with options of differing algorithms including a customised algorithm to allow more flexibility and change in insulin dose with smaller changes in glucose levels. VRIII is the established gold standard of care for managing hyperglycaemia among hospital inpatients who are nil by mouth for prolonged periods. However, the safety and efficacy of VRIII use following antenatal steroids administration and before or during birth in busy obstetric ward/delivery unit settings are uncertain (See Table 2). Following the December 2020 NICE guideline update pregnant women with type 1 diabetes are increasingly using continuous glucose monitoring (CGM) alone or in conjunction with continuous subcutaneous insulin infusion (CSII) or hybrid closed-loop systems.[7–9] These are usually continued to support diabetes self-management during antenatal hospital admissions, including during and after antenatal steroids administration and before and during birth. (See Table 3).

TABLE 1 Advantages and disadvantages of tight vs pragmatic glycaemic targets during labour and birth and when using steroids for suspected preterm birth

Approach	Advantages	Potential disadvantages
Traditional intrapartum capillary glucose target range of 4.0–7.0 mmol/L	Widely used Supported by NICE	Increased risk of use of VRIII which is intrusive for women and resource intensive for delivery units Increased risk of maternal hypoglycaemia (one episode every 10 h of use of VRIII).[30] Reduced autonomy for diabetes self-management May be too late to reverse the consequences of sustained fetal hyperinsulinism and/or to prevent neonatal hypoglycaemia
Pragmatic intrapartum capillary glucose target range of 5.0–8.0 mmol/L	Reduced use of VRIII which allows women more autonomy and mobility during/after birth Lower risk of maternal hypoglycaemia Reduced resource burden for delivery unit staff Almost all women with GDM and many women with type 2 diabetes can achieve these targets without any VRIII or s.c. insulin	Limited evidence-base Fear of potential increased risk of neonatal hypoglycaemia

TABLE 2 Potential complications associated with the use of the VRIII on maternity wards

Domain	Complication
VRIII initiation	• Delayed commencement leading to insufficient time to minimise neonatal hypoglycaemia and/or diabetic ketoacidosis (DKA) • Wrong connections • Lack of use of one-way anti-siphon valves • Incorrect programming
VRIII implementation	• Resource intensive and limits autonomy for diabetes self-management during birth • Insufficient blood glucose measurements resulting in either hypoglycaemia of hyperglycaemia • Titration scales that predispose to hypoglycaemia as there is no buffer zone between the lower capillary blood glucose target of 4.0 mmol/L and hypoglycaemia (<3.9 mmol/L) • Premature cessation of the substrate but with the continuation of the intravenous insulin infusion leading to hypoglycaemia • Hyponatraemia due to inadequate sodium in the substrate fluid • Hypokalaemia due to inadequate potassium in the substrate fluid • Fluid overload • Erroneous blood glucose measurements caused by use of glucose in arterial flush lines
VRIII cessation	• Careful timing of pre-meal and basal subcutaneous insulin needed

The choice of fluid accompanying VRIII also varies. NICE recommends the administration of intravenous dextrose. However, there is an association of peripartum hypotonic fluid administration with fluid overload, maternal hyponatraemia and neonatal hyponatraemia. Some maternity units administer a VRIII with no accompanying fluid ('dry sliding scale') to avoid hyperglycaemia, fluid overload and hyponatraemia (especially in pregnant women with renal disorders and preeclampsia), but this may increase the risk of maternal hypoglycaemia.

TABLE 3 Options for the peripartum management of women with type 1 diabetes using insulin pumps before and during birth

Options	Benefits	Potential risks
Continuation of CSII during labour/birth/cs	Empowers diabetes self-management Reduced resource burden on delivery unit staff Safe and effective intrapartum glycaemia, with observational data suggesting superior efficacy compared to VRIII	Manufacturers liability concerns of pump failure near diathermy sites
Planned use of VRIII during labour/birth	Complies with CSII manufacturers' guidance	Intrusive for women and resource intensive for delivery unit staff Intrinsic complications including user errors with establishment and cessation leading to DKA, fluid and electrolyte imbalance and inadvertent hypoglycaemia
CSII to be used if vaginal delivery, and VRIII if operative delivery	Complies with CSII manufacturers' guidance	As a category 1 CS can be called at any time, there is a risk that the VRIII will not be established
Continuation of CSII if vaginal, and cessation of CSII if urgent section called	Complies with CSII manufacturers' guidance	CSII can be safely stopped for up to 60 min but must be restarted immediately post-operatively to prevent DKA

Consequently, this updated JBDS guideline recommends administering 0.9% saline with 5% dextrose and 0.15% potassium chloride alongside a VRIII. This is in accordance with NICE guidance on the prevention of inpatient hyponatraemia in hospitalised children and young people.[10] To avoid fluid overload, the rate of this fluid should not exceed 50 ml/hr (NICE).

2 | GLUCOSE MANAGEMENT AFTER ANTENATAL CORTICOSTEROID THERAPY

When women with diabetes are given corticosteroids for fetal lung maturation in the setting of anticipated preterm birth, NICE recommends that their glucose levels are closely monitored as most required additional insulin administration.[2] The neonatal respiratory benefits of steroid administration are well established and applicable to all pregnant women before 34 weeks of gestation. After 36 weeks gestation, the potential risks for increased neonatal hypoglycaemia and unphysiological activation of glucocorticoid receptors in the fetal brain may outweigh the potential respiratory morbidity benefits among women with diabetes.[11]

There are limited data to inform clinical practice on what are the most effective methods of insulin delivery (MDI, CSII, VRIII alone or in combination, or hybrid closed-loop systems) for achieving optimal glucose levels during and after steroids. Although most of the studies are among women with type 1 diabetes, some have included women with type 2 diabetes and GDM. Increasing insulin dose by ~40%–50% at the time of steroid administration is effective in preventing severe metabolic dysregulation in women with type 1 diabetes.[12,13] One study using VRIII achieved only moderate glycaemia after steroids with median glucose between 5.8 and 8.9 mmol/L in women with pre-existing diabetes or GDM.[14] The use of a pregnancy-specific VRIII (vs generic VRIII) in women with GDM receiving steroids was associated with increased the percentage time in range (TIR) from 55% to 68%, decreased maternal hypoglycaemia from 12% to 2% and decreased neonatal hypoglycaemia from 54% to 29%.[15] Similar improvements are reported in women with pre-existing diabetes.[16] However, neonatal hypoglycaemia in women who delivered within 48 h of steroid administration was common irrespective of whether a pregnancy-specific or generic VRIII was used (63% or 70%). Maternal hypoglycaemia (BG < 3.8 mmol/L) was common, affecting almost one in two women with more severe hypoglycaemia (BG < 3.0 mmol/L) experienced by 11% and 13% of women using pregnancy specific or generic VRIII, respectively.[16] In an RCT comparison of subcutaneous and intravenous insulin replacement, more women achieved target glucose levels with subcutaneous insulin (statistically significant in women with GDM) with no difference in rates of maternal and neonatal hypoglycaemia[17] Recent studies using automated closed-loop insulin delivery show wide intra-individual variation in total daily insulin doses but on average a 50% increase in insulin dose in the 48 h after the first

dose of corticosteroids.[9] During the CONCEPTT trial, approximately 25% of pregnant women with type 1 diabetes were admitted for antenatal corticosteroids and most continued diabetes self-management.[8] A recent retrospective study described antenatal corticosteroid administration rates of 8.8% in a multi-ethnic New Zealand population (65% GDM, 21% type 2 diabetes, 13% type 1 diabetes).[18] The average duration of hyperglycaemia was 3 days with almost all women (>90%) experiencing hyperglycaemia >7.0 mmol/L, and over 50% with hyperglycaemia >10.0 mmol/L. There was a possible link with neonatal hypoglycaemia in women who were hyperglycaemic (BG 7 and 8) within 24 h of birth or had BG >11 mmol/L at the time of the last course of steroids. However, the rates of maternal hypoglycaemia before and after corticosteroid administration were high (49% and 58% of mothers with type 1 diabetes). These results signify the importance of weighing up both the maternal and neonatal consequences of any intervention to manage steroid-induced hyperglycaemia.

Whilst some single centre studies have demonstrated the safety of intensive insulin therapy in both critical care and obstetric units,[15,16,19,20] larger multi-centre studies demonstrate that this approach is also associated with increased harmful consequences of inpatient hypoglycaemia.[21,22] Only larger randomised trials are adequately powered to detect a between-group difference in hypoglycaemia. Therefore, the risks and benefits of intensive insulin therapy should be carefully evaluated in hospitalised maternity patients.[21,23,24] The pragmatic strategy brings the obstetric unit into line with the accepted practice for preventing harm from intensive insulin therapy in hospitalised people with diabetes.

Based on the evidence cited above and by consensus within the JBDS group this updated guideline recommends using either the NICE target (4.0–7.8 mmol/L) or the liberal target zone (5.0–8.0 mmol/L), for safely managing inpatient hyperglycaemia during and after steroid administration (Level 7 evidence) (Appendix 2 and 4 of updated JBDS guideline). VRIII is recommended only if blood glucose targets are outside the target range on two consecutive occasions in spite of increased insulin doses (typically by ~50%).

3 | PERIPARTUM GLYCAEMIC CONTROL AND NEONATAL HYPOGLYCAEMIA

Neonatal hypoglycaemia results from excessive fetal insulin production as a consequence of the sudden cessation of maternal-fetal glucose transfer after birth. The rates of neonatal hypoglycaemia vary between different patient populations and different study definitions. Recent data suggest an approximate prevalence of clinically relevant neonatal hypoglycaemia, defined as requiring treatment with intravenous dextrose, of ~5% in gestational diabetes, ~20% in type 2 diabetes and ~30% in type 1 diabetes pregnancy.[3] During the CONCEPTT trial in type 1 diabetes pregnancy, rates of clinically relevant neonatal hypoglycaemia was 15% in women using CGM compared to 28% with women using capillary glucose monitoring.[8] The number of mothers needed to treat with CGM to prevent one clinically relevant neonatal hypoglycaemia was eight; strongly suggesting that neonatal hypoglycaemia was associated with sustained maternal hyperglycaemia throughout the second and third trimesters. A subsequent secondary analysis found no difference in intrapartum glycaemia between mothers of neonates with and without hypoglycaemia.[25]

Recent data contrast with previous studies suggesting that maternal hyperglycaemia during labour was associated with an increased risk of neonatal hypoglycaemia.[26] Many of the studies on which NICE based their tight intrapartum glucose target range (4.0–7.0 mmol/L) were published during 1985–2000 and predated the use of insulin analogues and modern diabetes technologies including inulin pumps and CGM. Data were often not adjusted for important maternal and neonatal confounders like the type of diabetes, maternal glycaemia during pregnancy, birthweight or gestational age at delivery.

Observational data in 161 pregnant women with type 1 diabetes using insulin pumps or VRIII demonstrated that women who continued to self-manage their diabetes using CSII achieved lower glucose levels during delivery than those who were switched to IV insulin.[27] The authors noted high rates of maternal hypoglycaemia associated with tight intrapartum glucose targets. They recommended that it should be standard practice to allow women the option of choosing diabetes self-management CSII during labour and delivery.[27] An ongoing qualitative evaluation of the AiDAPT randomised controlled trial (https://clinicaltrials.gov/ct2/show/NCT04938557) has further highlighted women's safety concerns regarding inpatient management of diabetes by obstetric ward staff who have minimal diabetes training.

Taken together, the recent data and increased use of diabetes technology allowing women more autonomy for self-management of their diabetes during hospital admissions have generated widespread support for a pragmatic approach. The updated JBDS guidelines offer the option of using either the NICE intrapartum glucose target of 4.0–7.0 mmol/L or the pragmatic target range of 5.0–8.0 mmol/L. The pragmatic target glucose level of 5.0–8.0 mmol/L during labour may be safer for

women without increasing the risk of neonatal hypoglycaemia (Table 1). The guideline also recommends that the midwives on obstetric wards and delivery units should have at least two hours of annual diabetes training with yearly updates on managing VRIII and an introduction to novel diabetes technology. All women with diabetes using insulin during corticosteroids, labour and birth should be supported by a daily diabetes team review.

4 | PERIPARTUM RECOMMENDATIONS FOR ALL WOMEN WITH DIABETES

- All women with pre-existing diabetes or gestational diabetes should be seen in joint diabetic/obstetric clinics to monitor treatment and to discuss, agree and document a peripartum diabetes management plan. This plan should include the blood glucose target zone
- Women using intermittent or real-time continuous glucose monitoring (CGM) should be advised that additional capillary glucose tests may be required during labour and delivery. CGM measures interstitial glucose levels, and changes may lag 5–10 min behind capillary blood glucose measurements. CGM can be used to guide diabetes self-management but CGM should NOT BE USED to guide VRIII doses
- The peripartum diabetes management plan includes hourly glucose monitoring using CGM or capillary glucose measurement during established labour or after artificial rupture of membrane or on admission for caesarean section
- The intrapartum glycaemic target (either 4.0–7.0 mmol/L or 5.0–8.0 mmol/L) and the methods used to achieve this target should be clearly documented
- VRIII should be considered if two consecutive blood glucose levels are above the target range (7.0 or 8.0 mmol/L). The second blood glucose should be checked within an hour to prevent any delay in starting VRIII. For VRIII, a syringe pump is set up with 50 units of human soluble insulin (e.g. Humulin® S or Actrapid®) in 49.5 ml of normal saline (See Appendix 1 and 3 of updated JBDS guideline)
- If general anaesthesia is used, capillary blood glucose should be monitored every half an hour until the woman is fully conscious
- The recommended substrate fluid to be administered alongside the VRIII is 0.9% NaCl with 5% glucose and 0.15% KCl (20 mmol/L) or 0.3% KCl (40 mmol/L) at 50 ml/hr. Additional intravenous fluids may be required as per clinical need, e.g. haemorrhage. VRIII without substrate fluids may be required in some cases (e.g. fluid overload, hyponatraemia and preeclampsia). Pure dextrose containing fluids should be avoided due to the risk of hyponatraemia.
- During ongoing use of VRIII (>6 h), serum electrolytes should be checked 4–6 hourly to maintain electrolyte balance. If ketoacidosis is suspected, blood ketones should be checked.
- Particular care relating to fluid management is needed in women with preeclampsia, as they may require fluid restriction alongside intravenous medications. The volume of all administered fluids should be carefully calculated. Provided there are no extra needs (e.g. haemorrhage), this should be kept to 80 ml/hr.[28]

4.1 | Additional recommendations for women on metformin or Multiple Daily Injections (MDI)

- The day prior to induction, and during cervical ripening, glucose testing, insulin and oral glucose-lowering drugs should continue as usual
- Prandial insulin (and metformin if taken) should be stopped if VRIII is started
- Basal insulin should be continued in women using insulin glargine (Lantus®, Toujeo®, Semglee®, Abasaglar®), Detemir (Levemir®), NPH insulin (Insulatard®), Insuman® Basal or Humulin® I or other basal insulins but prandial insulin should be discontinued if VRIII is started

4.2 | Additional recommendations for women with type 1 diabetes on CSII

- Most women will self-manage their insulin pump doses, often with assistance from their birth partner. They will use correction boluses and/or basal rate changes to maintain target glucose levels following steroid administration and before and during birth
- The manufacturers of the CSII pumps state that the pumps should not be used near unipolar diathermy because of the potential for electrical conduction. However, CGM and CSII are now increasingly used during caesarean section with both unipolar and bipolar diathermy. Women should be informed of the hypothetical risk and advised that a Teflon cannula can be used if the insulin pump and CGM sensor are situated away from the operative site and the diathermy pad(s). Steel infusion sets are not applicable for peri-operative use

- A discussion on intrapartum diabetes management in the event of a planned or emergency Caesarean section should be considered. The options include continuation of CSII; transition to VRIII; or temporarily stop CSII (if glucose levels are within target) and recommence CSII, switching to postpartum basal rates immediately after surgery. CSII removal should not exceed 60 min. Table 3 highlights the potential advantages and disadvantages of the alternative strategies
- Further guidance on the safe perioperative use of the CSII is found in the patient-centric multidisciplinary guidance produced by the centre for perioperative care (CPOC)[23]
- If the woman is unable to manage, or her glucose control is unstable or deteriorates, i.e. blood glucose >7.0 or 8.0 mmol/L on two consecutive occasions, or has urinary ketones ++ or more, or high ketones (>1.5 mmol/L), then fixed rate intravenous insulin infusion (FRIII) should be immediately commenced. CSII should be switched off, removed, labelled, and safely stored for postpartum use
- The insulin pump settings can be changed to postpartum doses by the woman or her partner immediately before or after surgery. It is important to confirm that each of the pump settings has been adjusted for postpartum glucose targets (typically 6.0–8.0 mmol/L), basal rate (at least 50% reduction), insulin to carbohydrate ratio (typically 12–15 g carbohydrate), and insulin sensitivity factor (typically 4.0 mmol/L)

5 | POSTPARTUM MANAGEMENT OF WOMEN WITH DIABETES

- NICE recommends that babies of mothers with all types of diabetes should be monitored for neonatal hypoglycaemia for at least 24 h post-delivery[2]

5.1 | Additional recommendations for women with insulin-treated diabetes

Insulin requirements drop immediately after delivery of the placenta. Commonly used options include reverting to the pre-pregnancy dose, 25% reduction from the first-trimester dose or 50% of the late pregnancy doses. Data from the use of closed-loop highlights substantial intra-individual variability but suggests that the average total daily insulin dose is approximately 50% of the late pregnancy dose.[29] Postpartum insulin doses should be reviewed in conjunction with the diabetes team daily, with an emphasis on minimising the risk of maternal hypoglycaemia, and before hospital discharge.

- The rate of VRIII should be reduced by 50% immediately after delivery. Hourly glucose monitoring should be continued until the first meal is eaten. Ensure woman is eating and drinking before restarting subcutaneous insulin
- VRIII should be stopped 30–60 min after the first subcutaneous pre-meal insulin injection. Women using CSIII may not necessarily require pre-meal insulin with the first light meal after delivery
- A post-partum glucose target range of 6.0–10.0 mmol/L is applicable for women with insulin-treated diabetes. This applies to hospitalised patients on glucose-lowering medication[24]
- Postpartum insulin regimen should be resumed as per individual diabetes management plan. If there is no documented diabetes plan, the early pregnancy (about 12 weeks gestation) doses should be reduced by 25% or the late pregnancy (about 36 weeks gestation) doses by at least 50%
- Thereafter, healthy eating should be encouraged with increased carbohydrates as required to minimise the risk of hypoglycaemia, if breastfeeding/expressing. Women should be advised to snack (10–15 g carbohydrate) and drink each time they feed or express milk (including night feeds). Up to 450 extra calories per day may be needed when feeding is fully established. Additional calories may be needed with multiple births. Healthy eating should be encouraged without additional calories or carbohydrates for women who are bottle-feeding

5.2 | Additional recommendations for women previously not on insulin

- Insulin infusion or injections should be stopped when the placenta is delivered
- Glucose monitoring should be continued 4-hourly until the first meal. Thereafter pre-meals and pre-bedtime glucose levels should be monitored. Because metformin does not cause hypoglycaemia, a target glucose range of 4.0–10.0 mmol/L is acceptable. For those on other oral glucose-lowering medications, the target range is 6.0–10.0 mmol/L
- In women with gestational diabetes (GDM), glucose levels should be monitored pre- and post-meals for 24 h to detect new or pre-existing diabetes (fasting glucose >7.0 mmol/L and post-meal >11.1 mmol/L)
- Healthy diet choices should be encouraged with a low GI diet along with weight management advice and referral for national diabetes prevention and/or weight management programmes as applicable

6 | WOMEN WITH DIABETES DEVELOPING EITHER PRE-ECLAMPSIA OR DIABETIC KETOACIDOSIS.

DKA complicates approximately 2.5% of pregnancies, whilst preeclampsia complicates around 12–13% of deliveries of women with type 1 diabetes. Both conditions can exceed the capability of delivery units. It is, therefore, recommended that specialist teams are involved in the management of these complicated patients.

7 | PROMOTING AUTONOMY AND SAFE DELIVERY IN WOMEN WITH DIABETES AND HYPERGLYCAEMIA

Pregnant women with diabetes report feeling vulnerable when the ability to control their own blood glucose levels is taken away from them during acute hospital admissions and is instead 'in the hands' of less experienced antenatal and delivery ward staff. It is hoped that these guidelines will help improve the consistency of peripartum glucose management and also support those women who are able to self-manage using insulin pumps and advanced diabetes technology. Research led by investigators at the University of Nottingham is underway to determine current NHS practices in intrapartum glucose control and to evaluate the feasibility of future clinical trials of permissive versus intensive intrapartum glycaemia (https://fundingawards.nihr.ac.uk/award/NIHR130175). Until results are available, we hope that these JBDS guidelines will encourage diabetes pregnancy teams to discuss both options with pregnant women and to audit their local clinical practice.

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CONFLICT OF INTERESTS

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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