# Application of continuous glucose monitoring and automated insulin delivery technologies for pregnant women with type 1, type 2, or gestational diabetes: an international consensus statement

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**Insulin resistance increases after the first trimester of pregnancy, leading to glycaemic challenges for women with pregestational type 1 diabetes or type 2 diabetes. Additionally, insulin resistance can promote hyperglycaemia in pregnant women without type 1 diabetes or type 2 diabetes, who develop gestational diabetes. Although most (>95%) women with diabetes deliver healthy babies, maternal dysglycaemia can have consequences for the mother and child, including prenatal, perinatal, immediate, and long-term postnatal complications. Diabetes technologies, such as continuous glucose monitoring (CGM) and automated insulin delivery (AID) systems can aid in optimising glycaemia outside of pregnancy. These novel technologies have not been extensively tested in large randomised controlled trials before and during pregnancy. However, compelling data report the benefits of CGM in type 1 diabetes, and increasing data report on AID systems in pregnancies complicated by type 1 diabetes. Appropriate CGM glucose thresholds for the diagnosis of gestational diabetes and the recommended time in range treatment targets for the routine management of gestational diabetes and type 2 diabetes still need to be determined. The recommendations in this Consensus Statement emphasise the value of CGM during preconception and pregnancy for women with pregestational type 1 diabetes in reducing pregnancy complications. Recommendations also include the use of AID systems in women with pregestational type 1 diabetes to improve glycaemic management during preconception, during pregnancy and delivery, and in the postpartum period. This Consensus Statement has been endorsed by 24 societies and groups.**

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## Introduction

Pregnant women with pregestational type 1 diabetes or early onset type 2 diabetes and women with gestational diabetes are at increased risk of obstetric and neonatal complications.[1–4] Substantial progress has been made to ensure that women with any type of diabetes have healthy pregnancies, with therapeutic advances including insulin analogues and continuous glucose monitoring (CGM) technologies.[1–4] Automated insulin delivery (AID) systems have (when available) become the standard of care for people with type 1 diabetes outside of pregnancy, and are increasingly used before and during type 1 diabetes pregnancy.[5] As diabetes technology evolves, the safety and efficacy data supporting the use of AID systems in pregnancy is growing.[5] To distil the several outcomes and clinical applications proposed for diabetes technologies during pregnancy with diabetes, a clinical consensus panel was convened to make evidence-based recommendations for the optimal care of women with pregestational type 1 diabetes or type 2 diabetes during pregnancy and for women with gestational diabetes. This International Consensus Statement focuses on CGM and AID systems as diabetes technologies that have the potential to be used in pregnancy to improve outcomes in women with diabetes. Other aspects of a multitargeted approach to the management of diabetes in pregnancy,[2] or other technologies (such as apps or smart pens), are outside of the scope of this Consensus Statement.

This Consensus Statement uses the terms woman or mother to minimise misrepresentation of health statistics and cross-cultural communication barriers, and maintain visibility of the unique needs, experiences, and rights that come with pregnancy, birthing, and breastfeeding. The discussion herein also applies to people who do not identify as women, but are pregnant or have given birth, recognising that inclusivity and consideration of medical and social needs for this group require additional unique attention.[6]

This Consensus Statement has been endorsed by the ADJ Diabetes Brazil, Advanced Technologies and Treatments for Diabetes, the American Association of Clinical Endocrinology, the American College of Diabetology, the American Pharmacists Association, the Association of Diabetes Care and Education Specialists, the Australasian Diabetes in Pregnancy Society, the Australian Diabetes Society, the Australian Diabetes Educators Association, the Brazilian Diabetes Society, Breakthrough T1D, the Centre for Chronic Disease (India), Diabetes Australia, DiabetesIndia, the European Association for the Study of Diabetes, the European Board and College of Obstetrics and Gynaecology, the Indian College of Obstetricians and Gynaecologists, the International Association of Diabetes and Pregnancy

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Study Groups, the International Diabetes Federation, the International Federation of Gynaecology and Obstetrics, the Japan Diabetes Society, the Research Society for the Study of Diabetes India, the Society for Obstetric Medicine India, and the World Organisation of Family Doctors. The American College of Obstetricians and Gynecologists supports the value of this clinical document as an educational tool.

## Methods

The diaTribe Foundation—a non-governmental organisation—invited health-care professionals with expertise in the use of CGM and AID in diabetes during pregnancy to participate in a consensus panel that complied with the Accurate Consensus Reporting Document (ACCORD) criteria.[7] We used the nominal group technique, combining brainstorming, discussion, and refinement of ideas.[8] The nominal group technique is designed to allow every participant to voice their views at all distinct stages, and to agree or disagree within the overall group structure. Opinion leaders were drawn from academic institutions and diabetes, obstetric, and primary care associations globally. The writing group was selected to be multidisciplinary, and included representatives from different continents (Europe, North America, Australia, Asia, Africa, and South America). All authors of this Consensus Statement are members of the consensus writing group. People living with diabetes (including individuals with experience of having diabetes in pregnancy) and family members outside of academia were also invited. Participation in the writing group was voluntary and not remunerated. KB, JH, ML, and HRM created a compendium of topics for consideration by the writing group, who in turn provided two rounds of objective feedback (at in-person and online meetings in March, 2024, November, 2024, and January, 2025). A consolidated draft manuscript and recommendations based on this feedback were further developed and refined at the International Consensus on Diabetes Technology in Pregnancy meeting in March, 2025, before the Advanced Technologies and Treatments for Diabetes conference, also in March, 2025. Each individual recommendation was discussed until a consensus was reached, with 100% of the consensus group voting in agreement. These discussions, with feedback from external reviewers and international professional associations, were used to further refine the consensus document over multiple drafts following the March 2025 meeting. The final draft was then approved by all members of the writing group.

## General discussion

### Access and equity in the use of diabetes technologies

Disparities in diabetes care for some groups are long standing and have increased in the past decade.[9–11] Access to diabetes technologies, including previous forms such as self-monitoring of blood glucose (SMBG), varies substantially in different settings due to disparate market access, health systems, and other factors.[12,13] Even within countries, studies have consistently shown 50% lower rates of access to diabetes technology among individuals with diabetes and low socioeconomic status compared with individuals in the highest quartiles of socioeconomic status, as well as among some racial and ethnic groups.[14–20] Addressing disparities in diabetes technology use might improve population-level glycaemic outcomes—widespread implementation of CGM has shown that health inequalities can be overcome, including population-level improvements in maternal and fetal health.[21] In this context, we acknowledge that the implementation of some recommendations might be more difficult for some populations within high-income countries, in most low-income and middle-income countries, and in conflict zones. In every situation, systems-level intervention is needed to improve access and health literacy in the use of diabetes technologies for healthy maternal and perinatal outcomes.

### Pregnancy is an insulin-resistant state

With advancing gestation after the first trimester, increases in insulin resistance and delayed insulin absorption (or reduced insulin secretion in type 2 diabetes) can result in high blood glucose concentrations.[22–25] During pregnancy, diabetic ketoacidosis is a life-threatening emergency for both the mother and fetus, with high rates of stillbirth associated with diabetic ketoacidosis (160/1000 pregnancies) occurring mainly in women with pregestational type 1 diabetes (1–2% of pregnancies).[26] However, stillbirth associated with diabetic ketoacidosis can also occur in pregestational type 2 diabetes (0·1%)[26] and in gestational diabetes (0·02%).[27] Beyond insulin management, meeting recommended glycaemic targets, avoiding hyperglycaemia, and the use of ketone monitoring are key to reducing diabetic ketoacidosis events in type 1 diabetes pregnancies; however, ketone monitoring is not routinely recommended in type 2 diabetes or gestational diabetes. Continuous ketone monitoring devices are currently in development,[28] including sensors with dual CGM and continuous ketone monitoring capability, but the role of ketone monitoring (eg, during sickness) is unknown during pregnancy.

### CGM to support general diet and physical activity recommendations

Pregnant women with diabetes are counselled regarding healthy behaviours, including a balanced diet inclusive of proteins, whole grains, healthy fats, fruits, and vegetables, along with regular physical activity, to improve health and optimise glycaemia.[29] Randomised controlled trials (RCTs) and crossover trials of nutritional-based or exercise-based interventions have focused on women with gestational diabetes, with little high-quality data in pregestational type 1 diabetes or type 2 diabetes.[30] These studies have

reported mixed results, including a moderate effect on fasting plasma glucose (FPG) and/or postprandial plasma glucose (PPG).[30,31] Studies on physical activity for lowering FPG and/or PPG[30,32,33] have generated inconsistent results. The use of CGM allows pregnant women to see the real-time relationship between glucose concentrations, diet, and physical activity.

### Integrating CGM data into the care of pregnant women with diabetes

CGM systems enable individuals with diabetes to track glucose fluctuations in real time and react to them as needed. Cloud-based platforms allow CGM data to be shared with a clinical team instantaneously, and can allow for rapid response times to questions or concerns from the individual CGM user.[34] Ideally, CGM data would be integrated into electronic health records, including ambulatory glucose profiles—the standard modality for viewing aggregated CGM data (typically 7–14 days).[35] Ambulatory glucose profile reports offer data visualisation for non-pregnant women and only some offer customisation for pregnancy-specific glucose goals. With a history of incorporating new consensus metrics and methods of visualising CGM data,[36] the ambulatory glucose profile report should include options to view the pregnancy-specific time in range (TIRp) of 3·5–7·8 mmol/L (63–140 mg/dL), which is widely used in type 1 diabetes pregnancy since an international consensus statement in 2019.[37] This inclusion would support patients and clinicians to make necessary therapy adjustments specific for diabetes pregnancy care, although CGM glucose thresholds for the diagnosis and management of type 2 diabetes and gestational diabetes still need to be determined. Notably, discrepancies currently exist in the metrics generated by different CGM sensors and depend on the comparator method used, indicating the need for industry-wide standards and comparator harmonisation such that CGM metrics can be interpreted consistently.[38,39]

### Integration of diabetes technology in the workflow of the diabetes and pregnancy care team

With increased availability and acceptability of CGM, many women will have access to this technology in pregnancy, either via prescription or over the counter. CGM and AID systems are advantageous in that they facilitate remote access to daily glycaemic pattern profiles, along with insulin delivery data for AID systems. Integration of these systems and the data they provide into clinical practice and office workflows will ideally require a multidisciplinary approach, including nursing and midwifery staff, pharmacists, diabetes care and education specialists, advanced practitioners, obstetricians, and other physicians. Importantly, CGM devices should be validated for use during pregnancy or should at least meet the US Food and Drug Administration integrated CGM performance criteria.[40,41] CGM integration into pregnancy care will require user education on how to best use the technology, such as understanding alerts or alarms and trend arrows and the effects of diet and physical activity on glucose concentrations. Furthermore, education of health-care teams who are less familiar with the use of diabetes technologies (including primary care) or who might have a supporting role in preconception, antenatal, and postnatal care of women with diabetes is an essential component of implementing the consensus recommendations.

### Impact of diabetes technology on maternal mental health

Women with diabetes face heightened risks of mental health issues during pregnancy and the postpartum period, including depression, anxiety, and stress—largely due to the added burden of living with a chronic condition.[42–45] Diabetes technology might either ease or increase this burden, and research suggests that some women can have disturbed sleep,[46] increased anxiety, and symptoms of depression with CGM use,[47] whereas others can have benefits that include reduced stress, diabetes distress, and fear of hypoglycaemia, as seen in observational studies outside of pregnancy.[48–51] The impact of diabetes technology can vary by type of diabetes in pregnancy. Ultimately, the application of diabetes technology should be tailored to individual needs, balancing the impact on mental health with diabetes management and outcomes.

## Diabetes technology in type 1 diabetes during pregnancy

### Prepregnancy care in type 1 diabetes

Maternal glycaemia is a modifiable risk factor, and avoiding hyperglycaemia before conception reduces the risks of congenital malformations and miscarriage.[3,52] Maintaining target glycaemia during pregnancy reduces complications attributed to fetal hyperinsulinaemia, including preterm births, large for gestational age (LGA) infants, and neonatal care admissions.[3,53] The $HbA_{1c}$ target should be less than 7·0% (<53 mmol/mol) during preconception or less than 6·5% (<48 mmol/mol), if feasible, during pregnancy (table 1).[3,29,56] CGM systems have become the standard of care for managing type 1 diabetes during pregnancy.[3,29,37,56,57] International consensus targets recommend a TIRp of 3·5–7·8 mmol/L (63–140 mg/dL) more than 70% of the time (table 1).[37,58] Evidence that the use of pregnancy-specific glycaemic targets with CGM during preconception can improve pregnancy outcomes is currently scarce.

AID systems use an algorithm, insulin pump, and CGM sensor to provide glucose-responsive insulin delivery with user-initiated pre-meal insulin boluses.[59–61] Specific data on AID systems in the preconception period are insufficient, but data from outside of pregnancy have indicated that AID systems support reaching glycaemic goals, leading to a 12% higher time in range (TIR) of

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| | Measures | Aim |
|---|---|---|
| $HbA_{1c}$ when planning pregnancy | $HbA_{1c}$, which reflects glycaemic concentrations over the past 3–4 months | <7·0% (<53 mmol/mol); <6·5% (<48 mmol/mol) if feasible |
| $HbA_{1c}$ first trimester | NA | <6·5% (<48 mmol/mol) |
| $HbA_{1c}$ second and third trimester | NA | <6·0% (<42 mmol/mol)[54] |
| Percentage of sensor data obtained | The proportion of obtained versus total possible data collected by the CGM device; provides a measure of confidence in all data-derived metrics | ≥70% of data during the collection period[38] |
| TIR when planning pregnancy | Percentage of time spent between 3·5 mmol/L and 7·8 mmol/L (63–140 mg/dL) for pregnancy if possible or between 3·9 mmol/L and 10·0 mmol/L (70–180 mg/dL) otherwise | >70% of time per day (ie, 16 h 48 min) |
| TIRp | Percentage of time spent in consensus target glucose range in pregnancy—ie, between 3·5 mmol/L and 7·8 mmol/L (63–140 mg/dL) | >70% of time per day (ie, 16 h 48 min)† from as early as possible following pregnancy confirmation |
| TBRp <3·5 mmol/L (63 mg/dL) | Percentage of time spent with glucose <3·5 mmol/L (<63 mg/dL) | <4% of time per day (1 h) |
| TBR <3·0 mmol/L (54 mg/dL) | Percentage of time spent with glucose <3·0 mmol/L (<54 mg/dL) | <1% of time per day (15 min) |
| TARp >7·8 mmol/L (140 mg/dL) | Percentage of time spent with glucose >7·8 mmol/L (>140 mg/dL) | <25% of time per day (6 h)‡ |
| Mean sensor glucose | Mean 24-h glucose concentration calculated across all recorded sensor glucose readings | Suggested mean sensor glucose of 6·0–6·7 mmol/L (108–120 mg/dL), based on expert opinion (evidence level E) |
| GMI | A measure of short-term glucose concentrations that can be used to predict long-term glucose exposure; GMI is expressed in the same units as $HbA_{1c}$ (eg, as a percentage or mmol/mol) for comparative purposes, but they are usually not identical | No international consensus target, but <42mmol/mol is suggested, which is similar to (but not equivalent to) a $HbA_{1c}$ of 6·0% |
| CV | Dynamic GV expressed as percentage CV and calculated as follows: 100 × (SD divided by mean glucose) | ≤36% of glucose variability in type 1 diabetes;[38] ≤30% in type 2 diabetes (NCT04972955)[55] |
| TIRp intrapartum | Percentage of time spent in consensus target glucose range—between 3·5 mmol/L and 7·8 mmol/L (63–140 mg/dL)—during labour and delivery | >70% of time intrapartum |
| TIR postpartum | Percentage of time spent in consensus target glucose range—between 3·9 mmol/L and 10·0 mmol/L (70–180 mg/dL)—following delivery | >70% of time per day |

CGM=continuous glucose monitoring. CV=coefficient of variation. GMI=glucose management indicator. GV=glucose variability. NA=not applicable. SD=standard deviation. TARp=pregnancy time above range. TBR=time below range. TBRp=pregnancy time below range. TIR=time in range. TIRp=time in range in pregnancy. *$HbA_{1c}$ is known to be an inconsistent marker of glycaemia during pregnancy, emphasising the value of CGM metrics. †Percentage of TIRp is specific for pregnant women with type 1 diabetes. Percentage of TIRp for pregnant women with type 2 diabetes and gestational diabetes should probably be more than 70%, but the exact amount is unknown due to a scarcity of data. ‡Percentage of TARp is specific for pregnant women with type 1 diabetes. Percentage of TARp for pregnant women with type 2 diabetes and gestational diabetes should be much less than 25%, but the exact amount is unknown due to a scarcity of data.

***Table 1:*** **$HbA_{1c}$ and CGM targets for pregnant women with type 1 diabetes***

3·9–10·0 mmol/L (70–180 mg/dL) than continuous subcutaneous insulin infusion (CSII) pumps or multiple daily injections (MDI).[59,60,62] AID systems should be initiated before pregnancy if possible to optimise preconception glycaemia.[2] AID systems with evidence of clinical effectiveness from larger RCTs in pregnancy should preferably be used (panel 1; table 2).[70,71,78] However, given that half of pregnancies in women with pregestational diabetes are unplanned,[80] AID systems proven to optimise antenatal glycaemia should be started as soon as pregnancy is verified—usually at 7–8 weeks gestation.

## Pregnancy care in type 1 diabetes

The CONCEPTT trial, including 325 women with type 1 diabetes (215 pregnant and 110 planning pregnancy), showed that real-time CGM leads to a significantly higher TIRp than SMBG, with reductions in LGA infants, neonatal intensive care unit admissions, and severe neonatal hypoglycaemia.[1] CGM use also reduces hypertensive disorders of pregnancy[81,82] and offers important cost savings, with improved neonatal outcomes.[66–69,83] Therefore, the use of CGM is recommended for pregnant women with type 1 diabetes (panel 1).[29,57,83]

The use of open-loop CSII does not improve glycaemia or pregnancy outcomes compared with MDI,[84–90] and higher rates of LGA infants have been reported in some studies.[89,91–93] In the CONCEPTT trial, MDI users had lower rates of gestational hypertension, neonatal hypoglycaemia, and neonatal intensive care unit admissions than CSII users.[94] RCTs and observational studies also indicate that the use of CSII compared with MDI results in higher gestational weight gain,[84] highlighting the challenge of optimising CSII settings, especially from the second trimester onwards, when insulin resistance increases.[95,96]

Sensor-augmented pump (SAP) therapy refers to the use of CSII and CGM together in an open-loop configuration. With partial AID functionality, the pump can be used in low-glucose-suspend mode or suspend-before-low mode, in which insulin delivery is suspended for up to 2 h once a preset hypoglycaemic threshold is reached or predicted to be reached (no automated corrections are made for hyperglycaemia). By contrast, when in the predictive low-glucose-suspend mode,

insulin delivery is suspended when an algorithm predicts hypoglycaemia within the next 30 min, with basal insulin restored once hypoglycaemia is corrected. When tested, both SAP and partial AID were safe and effective in minimising maternal hypoglycaemia,[97–99] but no improvements in TIRp or pregnancy outcomes were observed.

*Evidence from randomised controlled trials*

Most commercially available AID systems have not yet been robustly evaluated in pregnancy (table 2); however, two RCTs have tested the CamAPS FX and the MiniMed 780G AID systems in pregnant women with type 1 diabetes (table 2).[70,71] Notably, most women studied to date have been White. The CamAPS FX system is licensed for use globally in pregnancy, whereas the MiniMed 780G system is currently licensed only within Europe. The AiDAPT RCT compared CamAPS FX with standard care (MDI or open-loop CSII with CGM) in 124 pregnant women with type 1 diabetes, with an inclusion criteria of $HbA_{1c}$ of 6·5–10% (48–86 mmol/mol).[70,100,101] The use of CamAPS FX significantly increased the baseline-adjusted mean TIRp (10·5%—ie, an additional 2·5 h; 68·2% AID *vs* 55·6%), regardless of baseline $HbA_{1c}$ and previous technology use.[70] A TIRp of more than 70% was attained throughout pregnancy in 47% of patients in the AID group compared with 11% in the standard of care group. CamAPS FX users had lower rates of hypertensive disorders, less gestational weight gain,[70] and self-reported positive pregnancy experiences.[102]

The CRISTAL study randomly assigned 95 pregnant women with type 1 diabetes, comparing the MiniMed 780G AID system versus standard care with MDI or with open-loop CSII or partial AID and any CGM system,[71,103] with no lower $HbA_{1c}$ limit for inclusion. AID use did not improve the overall TIRp compared with standard care (66·5% *vs* 63·2%), but improved the overnight TIRp by 24 min (+6·58%), reduced the time below range in pregnancy (TBRp) by 19 min, and improved treatment satisfaction.[71] In contrast to real-world studies,[104] excess gestational weight gain was significantly lower in MiniMed 780G users compared with standard insulin therapy.[71] The algorithm performed well overnight, but often required assisted carbohydrate administration (adding so-called fake carbohydrates) with meals—further refinement is needed for use later in pregnancy. AID is also likely to be cost-saving compared with standard care.[105] The AiDAPT and CRISTAL trials were not powered for pregnancy outcomes.

The pilot PICLS RCT compared the MiniMed 670G as a hybrid closed loop AID system with the same device used as an SAP system in 23 women.[75] The mean glucose was significantly higher and the TIRp tended to be lower but this was not statistically significant (p=0·17) in the third trimester with AID functionality. Hypoglycaemia fear improved for AID users.[106] Assistive techniques were used, such as so-called fake carbohydrate boluses and exiting AID functionality overnight, as needed.[75,107] As this AID system was a first-generation device, it is no longer available in most countries.

***Panel 1:* Recommendations for using diabetes technology in pregnant women with type 1 diabetes and those planning pregnancy**

Each of the recommendations in this consensus have been assigned a level of supporting evidence (ie, A, B, C, or E) that adheres to the evidence-grading system of the American Diabetes Association Standards of Medical Care in Diabetes (appendix p 5).[29]

- Glycaemia should be optimised when planning pregnancy to reduce the risk of pregnancy complications (A).[55,63,64] The use of continuous glucose monitoring (CGM) is recommended for all women with type 1 diabetes* to optimise glycaemia before pregnancy to reduce pregnancy complications (A),[1] such as reduced admissions to neonatal intensive care units, reduced incidence of large for gestational age infants and lowered occurrence of neonatal hypoglycaemia. CGM should be used to reach and maintain a time in range of 3·9–10·0 mmol/L (70–180 mg/dL)—more than 70% per day before pregnancy, targeting an $HbA_{1c}$ of <7·0% (<53 mmol/mol) or <6·5% (48 mmol/mol) if feasible (A).[1,65]
- CGM use during pregnancy results in important cost savings, or is cost neutral, compared with self-monitored blood glucose testing, with improved neonatal health outcomes (A).[66–69]
- Automated insulin delivery (AID) systems with randomised controlled trial (RCT) evidence for use in pregnancy and showing clinically relevant benefits in glycaemia are recommended for use by women with type 1 diabetes intending to conceive, starting preconception (A).†[70–72]
- AID systems with evidence from RCTs in pregnancy and showing clinically relevant benefits compared with standard insulin therapy and CGM are recommended for women with type 1 diabetes during pregnancy,† preferably those showing clinically relevant improvements (5% time in range in pregnancy [TIRp] increase daily), with pregnancy-specific glucose target settings, with systems that can adapt to changes in insulin sensitivity or a pregnancy-specific algorithm (A).[70–72] These systems can support improvements in TIRp of 3·5–7·8 mmol/L (63–140 mg/dL), with improved glycaemia overnight, a reduction in hypoglycaemia, and less burden for the user.
- AID systems with evidence from RCTs and showing clinically relevant benefits in glycaemia outside pregnancy, but with little or no evidence of benefit in pregnancy, might be considered preconception (B), and potentially continued in selected women with type 1 diabetes during pregnancy when used with assistive techniques and by experienced health-care teams (B).† Systems with an appropriately low glucose target setting and clinically relevant benefits in glycaemia (at least a 5% TIRp improvement) should preferably be used (E).[29]
- Continued use of AID systems during delivery and immediately postpartum can allow the user and an experienced health-care team to maintain tight glycaemia without increased risk of time below range and is advantageous in that therapy does not need to be switched to manual insulin delivery or intravenous insulin infusion intrapartum (B).[73,74]
- AID systems can be safely used in early and late postpartum, with improved glycaemia compared with standard insulin therapy (A).†[75–77]
- We recommend providing pregnant women with type 1 diabetes using AID systems and their health-care team with instructions for AID system management during labour and delivery, and postpartum in the third trimester (E).

*People using CGM devices should also always have access to blood glucose meters (BGMs). People who are taking insulin and using BGMs should be encouraged to check their blood glucose concentrations when appropriate, based on their insulin therapy. †For all insulin pump users, pregnant women using AID systems should be vigilant regarding the risks of diabetic ketoacidosis, during times of hyperglycaemia, sickness, vomiting, or diarrhoea. Pregnant women should be provided with ketone monitoring equipment and be reminded to always carry spare insulin pump supplies and insulin pens.

See Online for appendix

| | Data in pregnancy and approval | Suggested pump settings and features for pregnancy*† |
|---|---|---|
| **CamAPS FX** | | |
| Cambridge treat-to-target adaptive MPC with mylife YpsoPump, DANA Diabecare RS, and DANA-i insulin pumps (with Dexcom G6/G7 or FreeStyle Libre 3 CGM); recommended customisable glucose targets of between 4·4 mmol/L and 5·5 mmol/L (80–100 mg/dL) during pregnancy; ease-off function to temporarily increase glucose target by approximately 2·5 mmol/L (45 mg/dL) and stop insulin delivery when glucose <7·7 mmol/L (<139 mg/dL); boost function to temporarily increase insulin delivery by approximately 35% (until target is reached) | Data from RCT available;[70] approved in >15 countries (UK, across Europe, Australia, New Zealand, USA [algorithm is approved but no compatible pump is commercially available], and Canada) | Personalised glucose target recommended setting of 5·5 mmol/L (99 mg/dL) before 16 weeks gestation and 5·0 mmol/L (80–90 mg/dL) from 16 weeks until delivery; overnight targets of 4·5 mmol/L (80 mg/dL) might be applicable from 2200 h to 0600 h from 20 weeks gestation; use boost as needed for 2 h to 4 h after large meals from 20 weeks gestation; update weight every trimester during pregnancy as needed; bolus 10–15 min before meals throughout pregnancy |
| **Diabeloop** | | |
| Diabeloop Generation 1 algorithm with Dexcom G6 CGM; customisable glucose targets of between 5·5 mmol/L and 7·2 mmol/L (99–130 mg/dL); adaptable features include aggressiveness in hyperglycaemia (conditions the administered boluses when glucose >10 mmol/L [>180 mg/dL]), aggressiveness in normoglycaemia (conditions the basal rate provided by the system when glucose values are between 3·8 mmol/L and 10 mmol/L [70–180 mg/dL]), and aggressiveness at breakfast, lunch, and dinner (conditions the amount of bolus in every intake); carbohydrate-to-insulin ratios and insulin sensitivity cannot be adapted | No data available from RCTs; no pregnancy indication | Lowest glucose target of 5·5 mmol/L (99 mg/dL); increase aggressiveness in hyperglycaemia, normoglycaemia, and at meals, as needed |
| **iLet** | | |
| Adaptive closed-loop algorithm with Dexcom G6 or Dexcom G7; customisable glucose targets of between 6·1 mmol/L and 7·2 mmol/L (110–130 mg/dL) in 0·6 mmol/L (10 mg/dL) increments, listed as lower, usual, and higher | No data available from RCTs; no pregnancy indication | Lowest glucose target of 6·1 mmol/L (110 mg/dL); update weight listed in pump with GWG |
| **Medtronic MiniMed 670/770G** | | |
| Treat-to-target PID technology with insulin feedback with Guardian 3 CGM; non-customisable glucose target of 6·7 mmol/L (120 mg/dL); temporary target of 8·3 mmol/L (150 mg/dL) | Data from small, pilot RCT available; [75] no pregnancy indication | Glucose target of 6·7 mmol/L (120 mg/dL, non-customisable); active insulin time of 2 h |
| **Medtronic MiniMed 780G** | | |
| PID technology with insulin feedback with the most advanced SmartGuard technology, with Guardian 3 or 4, Simplera, and Abbott Instinct CGM; customisable glucose target of 5·5–6·7 mmol/L (99–120 mg/dL) in 0·6 mmol/L (10 mg/dL) increments; temporary target of 8·3 mmol/L (150 mg/dL) | Data from RCT available;[71] European conformity mark (CE) for use in type 1 diabetes pregnancy in Europe | Glucose target of 5·5 mmol/L (99 mg/dL); active insulin time of 2 h—if safe meal bolus† occurs when strengthening meal carbohydrate-to-insulin ratios, relax carbohydrate-to-insulin ratios and add extra so-called fake carbohydrates with meals; bolus 10–15 min before meals and later in pregnancy |
| **Omnipod 5 (SmartAdjust)** | | |
| MPC algorithm with Dexcom G6 CGM, Dexcom G7 CGM, or FreeStyle Libre 2-Plus CGM; customisable glucose targets of between 6·1 mmol/L and 8·3 mmol/L (110–150 mg/dL)‡ in 0·6 mmol/L (10 mg/dL increments) | No data available from RCTs; no pregnancy indication | Lowest glucose target of 6·1mmo/L (110 mg/dL); correction factors need to be lowered in the second and third trimesters; short insulin action is needed (2–3 h); many additional correction doses are likely to be needed, especially postprandially, if glucose is <6·1 mmol/L (110 mg/dL) and the glucose arrow is trending down; manually entering the glucose value does not reduce the amount of insulin recommended for the bolus—turn off reverse correction§ and exit AID overnight as needed |
| **Tandem t:slimX2 or Tandem Mobi with Control-IQ or Control-IQ+ technology** | | |
| Treat-to-range MPC algorithm with Dexcom G6 CGM, Dexcom G7 CGM, and FreeStyle Libre 3-Plus CGM; non-customisable target range options; responsive to user basal rate and sensitivity adjustments; sleep activity range of 6·2–6·7 mmol/L (112–120 mg/dL), which can be used for 24 h, with optional exits to regular control of the IQ activity target range of 6·2–8·8 mmol/L (112–160 mg/dL) or the exercise activity range of 7·8–8·8 mmol/L (140–160 mg/dL) | RCT data available;[72,78] no pregnancy indication | Use sleep activity day and night; teach users not to accept bolus reduction correction when glucose is under 6·1 mmol/L (110 mg/dL); use so-called super bolus technique when possible;¶ need to split boluses for those that exceed 25 units or use U200 off-label; strengthening carbohydrate–insulin ratios, basal settings, and sensitivity; bolus 10–15 min before meals and later in pregnancy as needed up to 30–45 min before meals |

(Table 2 continues on next page)

| | Data in pregnancy and approval | Suggested pump settings and features for pregnancy*† |
|---|---|---|
| (Continued from previous page) | | |
| **Sequel Twist and open source systems (do-it-yourself APS—eg, Loop‖ and Android APS)** | | |
| MPC algorithm with Dexcom G6 CGM or Dexcom G7 CGM or FreeStyle Libre; fully customisable glucose targets; low user-set targets can be temporarily activated before meals to increase insulin delivery before eating to help with postprandial glucose rises; programme custom temporary override settings for future use (eg, post-meal high of 120–130% for 2–3 h); safety settings are individually set by user | No data from RCTs; no pregnancy indication | Personalised glucose targets; recommended daytime target of 5·0–5·5 mmol/L (90–99 mg/dL) before 16 weeks gestation; if glucose variability is low, a night-time target of 5·0 mmol/L (90 mg/dL) or less can be considered; after 16 weeks gestation consider lower targets; liberally use post-meal high custom override; consider if pre-meal target provides better results than pre-meal bolusing since bolusing shuts off the lower pre-meal target; for Loop users, consider using the LolliPop (30 min) food absorption time at meals after 16 weeks gestation; consider increasing the auto-bolus—microboluses from the default of 40% if user regularly misses food boluses; learn new system features and complete training modules or review system-specific resources before implementing new feature updates during pregnancy |

Adapted from Benhalima et al.[75] For all systems, availability differs across regions, with differences in algorithms according to differing regulatory systems and other regional factors. AID=automated insulin delivery. APS=artificial pancreas system. CGM=continuous glucose monitoring. GWG=gestational weight gain. MPC=model predictive controller. PID=proportional integral derivative. RCT=randomised control trial. *For all systems, pump settings (basal rates, carbohydrate-to-insulin ratios, insulin sensitivity factors, and active insulin time) should be adjusted for manual and automated modalities as appropriate for the stage of pregnancy and individualised care. †Safe meal bolus refers to a meal bolus amount that is adjusted downwards due to various factors that the algorithm considers, such as hypoglycaemia risk prediction within the next 4 h, active insulin on board, and total daily insulin dose. ‡FDA approved change to 5·6–8·3 mmol/L (100–150 mg/dL) anticipated in the USA in the first half of 2026. §Reverse correction refers to a calculated dose of insulin lower than that strictly derived from the carbohydrate-to-insulin ratio when the glucose concentration is below the target range at the time of carbohydrate announcement. ¶The so-called super bolus technique was initially promoted by John Walsh for the use of insulin pumps in non-pregnant populations. To avoid late hypoglycaemia when strengthening the carbohydrate-to-insulin ratios, the basal rates should be reduced during the late postprandial period.[113] ‖The Loop algorithm is now commercially available with the Sequel Twist system.

***Table 2:*** **Algorithm and glucose targets of the available AID systems and suggested settings for pregnancy**

The CIRCUIT RCT included 88 pregnant women with type 1 diabetes and gestation less than 14 weeks and a baseline $HbA_{1c}$ of 7·4%, comparing the Tandem t:slim X2 pump with Control-IQ versus standard care with MDI or open-loop CSII, both with CGM (table 2).[72] The outcomes indicated a significantly greater TIRp from 16 weeks to 34 weeks gestation in the AID group compared with the MDI or open loop with CGM group (65·4% *vs* 50·3%, respectively, with a mean adjusted difference of 12·5%; p<0·001). The percentage TBRp was also reduced for AID users (mean adjusted difference of –1·0%), as was the time above range in pregnancy (TARp) (mean adjusted difference of –11·5%). A case series with the t:slim X2 pump with Control-IQ or Basal IQ showed them to be safe during pregnancy,[108–110] with less burden than partial AID therapy in previous pregnancies.[108] No RCTs have been done in pregnancy with Diabeloop, Omnipod 5, or iLet AID systems. Two case series with the Omnipod 5 system reported a TIRp of between 56% and 82%, with the highest TIRp reached by manually exiting AID overnight.[111,112]

### *Evidence from real-world studies*

Although data from RCTs is the gold standard for framing clinical recommendations (appendix p 5), real-world evidence can provide important insights. Several systematic reviews and meta-analyses have examined the use of AID during type 1 diabetes pregnancy.[113–115] These meta-analyses included large RCTs and observational data up to September, 2024. These meta-analyses showed that AID systems outperformed standard care in nocturnal TIRp and time spent at less than 63 mg/dL. Two of three meta-analyses[113,114] concluded a glycaemic benefit of AID versus standard insulin therapy. However, these meta-analyses did not have power to evaluate pregnancy outcomes as none of the RCTs on AID in pregnancy were powered on pregnancy outcomes and the sample size was small.

A case series and observational studies with mostly MiniMed 780G and Tandem t:slim X2 Control-IQ showed that they could be safely used in pregnancy: increased TIRp and less burden were observed compared with previous pregnancies that used SAP therapy, or when compared with a group on MDI or open-loop pump therapy, although a TIRp of more than 70% was not reached in all women throughout gestation.[116–120] A real-world cohort study of 112 pregnant women with type 1 diabetes in Spain,[104] comparing MDI with AID (again mostly MiniMed 780G and Tandem t:slim X2 Control-IQ) in women with a median $HbA_{1c}$ of 48 mmol/mol (6·5%) at the first antenatal visit, indicated that MDI users had a greater reduction in $HbA_{1c}$ in the second trimester than AID users (–0·56% *vs* –0·20%), although no between-group significant difference existed in $HbA_{1c}$ in any trimester. Moreover, no significant differences were observed in TIRp between the groups, and AID users had less TBRp and

lower glycaemic variability in the second and third trimesters. However, AID users had more gestational weight gain (difference of 3·2 kg) and higher rates of macrosomia, although not significantly higher when adjusted for maternal weight gain or third trimester $HbA_{1c}$.[104] These study outcomes could have been affected by selection bias, as women might have been offered AID systems due to difficulties in reaching glycaemic goals or based on the personal preferences of women and their health-care providers. For example,[104] AID users had a longer diabetes duration compared with the MDI group, which can be associated with reduced achievement of tight glycaemia and more likely use of AID therapy. Another real-world study[121] comparing different AID systems in 137 pregnant women with type 1 diabetes (62% on MiniMed 780G, 27·7% on CamAPS FX, and 10·2% on Tandem Control-IQ) indicated a significantly lower $HbA_{1c}$ (–4·8mmol/mol) by the third trimester in CamAPS FX and Tandem Control-IQ users, and a 5·9% higher TIRp in the second trimester in CamAPS FX compared with MiniMed 780G. In addition, the adjusted odds ratio for LGA infants was lower in women using CamAPS FX (0·25) or Tandem Control-IQ (0·10) compared with MiniMed 780G users. Selection bias cannot be excluded due to the observational design. No information was available on the use of temporary system settings (such as sleep mode in Tandem Control-IQ, boost in CamAPS FX, or the use of assistive techniques, such as fake carbohydrates in MiniMed 780G), which could provide important additional insights into system use.

A non-controlled observational study of ten women on at-home use of a pregnancy-specific algorithm, with low daytime (4·4–6·0 mmol/L [80–108 mg/dL]) and nighttime (4·4–5·6 mmol/L [80–100 mg/dL]) glycaemic targets, reported an increase in the TIRp from 64·5% (with SAP or partial AID) to 78·6% (with AID; p=0·002) from 14 weeks to 32 weeks until delivery, with a reduction in hypoglycaemia.[122–125] This system is not commercially available, and the absence of a control group precludes conclusions on a causal effect. Data on unregulated, open-source artificial pancreas systems is limited to case reports of pregnant women with strong diabetes self-management skills, showing potential benefits in women with type 1 diabetes, but again limited by an absence of control groups.[120,126–129]

The consensus panel recommends the use of AID systems with evidence of benefits from large RCTs (panel 1).[70,71,72,130–132] AID systems with at least a 5% (72 min) increase in daily TIRp are recommended to achieve clinically relevant benefits for obstetric and neonatal outcomes.[133] The lowest glucose targets and strictest AID settings should be used to reach optimum glucose concentrations in most circumstances (table 2). Insulin-to-carbohydrate ratios should be strengthened in pregnancy to accommodate increasing insulin resistance and delayed insulin absorption (table 2). Boluses should initially be given 10–15 min before meals, but might need to be given up to 30 min before in late pregnancy, depending on the AID system used (table 2). Educational resources to support women using AID systems during pregnancy and experienced health-care staff should be accessible to optimise care.[134,135] Support should be individualised and intensified as needed to ensure that the woman is able to operate the device effectively. Due to delayed insulin absorption later in pregnancy, with increasing insulin doses and increased risk of blockage of infusion sets, changing the infusion sets more frequently is often necessary (at least every 3 days, especially later in pregnancy).[2]

High values for $HbA_{1c}$, TARp, average glucose, glucose management indicator, and glycaemic variability metrics, as well as low TIRp values (all reflecting maternal hyperglycaemia) are associated with increased pregnancy complications.[58,133,136–150] An observational cohort study of 117 women with either type 1 diabetes (58%) or type 2 diabetes (42%)[149] described optimal pregnancy outcomes with a TIRp of either 66% or 71% depending on the method of calculation, which is consistent with the international TIRp recommendation for CGM use in pregnancy (table 1).[151,152] A target for mean glucose could also be useful,[140,153] as mean glucose is highly correlated with overall glycaemia and is a modifiable determinant of fetal hyperinsulinaemia (table 1).[140,154] Some experts suggest tighter overnight TIRp targets; however, to date, no evidence exists supporting the use of different daytime versus nighttime targets (table 1). Notably, studies not using AID systems used SMBG glucose targets to optimise therapy, and the sole use of CGM-derived targets was not tested in RCT settings.

### Intrapartum and immediate postpartum care in type 1 diabetes

Guidelines recommend intrapartum glucose concentrations of 4·0–7·0 mmol/L (72–126 mg/dL) to reduce the risk of neonatal hypoglycaemia.[155–157] However, studies suggest that persistent maternal hyperglycaemia during the second and third trimesters and LGA, indicative of sustained fetal hyperinsulinaemia, are strongly associated with neonatal hypoglycaemia.[156,158–160] Therefore, targeting intrapartum glycaemia might not reverse sustained fetal hyperinsulinaemia.[161] A pragmatic approach with intrapartum glycaemic targets of 5·0–8·0 mmol/L (90–144 mg/dL) has been suggested to minimise maternal hypoglycaemia.[156] For some, continuation of CSII (including full or partial AID) intrapartum can help attain in-target glycaemia during this period.[162–165] Insulin sensitivity increases immediately after delivery; therefore, insulin doses should be reduced 50% or more postpartum compared with late third trimester doses, often 20% lower than before pregnancy, with further reductions in women who are breastfeeding.[156,166,167]

Observational data from 27 women showed that the use of the precursor of CamAPS FX maintained tight glycaemia intrapartum and early postpartum.[73] Case series with the Tandem t:slim X2 pump with Control-IQ showed that the target TIRp could be maintained intrapartum.[110,117] Compared with routine care, MiniMed 780G use was associated with a higher TIRp intrapartum (63·1% *vs* 71·5%), without an increased TBRp, and with a more than 85% TIR of 3·9–10·0 mmol/L (70–180 mg/dL) in the early postpartum period (table 3).[74]

Avoiding the need to switch mode of insulin therapy before delivery empowers women to manage their glucose concentrations and reduces health-care costs and staff burden.[163,164] Antenatal counselling and training for health-care professionals and pregnant women are crucial (panel 1). Suggestions for implementing AID intrapartum are listed in table 3.

## Late postpartum care in type 1 diabetes

For breastfeeding women, insulin doses are approximately 20% lower compared with prepregnancy,[169–172] potentially increasing the risk of night-time hypoglycaemia if insulin doses are not appropriately reduced.[170,171,173] The CLIMB study in 18 women using MiniMed 670G/770G with early (6–10 days postpartum) or delayed (12 weeks postpartum) AID use reported less maternal hypoglycaemia[76] and a small decrease in glucose after night-time breastfeeding was reduced with AID

| | Suggested settings intrapartum | Suggested settings postpartum |
|---|---|---|
| **CamAPS FX** | | |
| RCT data available intrapartum and up to 6 months postpartum[168] | Increase glucose target to 5·5–6·0 mmol/L (99–108 mg/dL); insulin-to-carbohydrate ratios of between 1:12g and 1:15g | Glucose target of 6·0 mmol/L (108 mg/dL) and use so-called ease-off as required; mean postpartum glucose target was 6·0 mmol/L (108 mg/dL) in the AiDAPT postpartum study; insulin-to-carbohydrate ratios of between 1:12g (non-breastfeeding) and 1:15g (breastfeeding) |
| **Diabeloop** | | |
| No data available | No recommendation due to absence of evidence | Adapt glucose targets between 5·5 mmol/L and 7·2 mmol/L (99–130 mg/dL); adapt aggressiveness in hyperglycaemia, normoglycaemia, and at meals, as needed |
| **iLet** | | |
| No data available | No recommendation due to absence of evidence | Adapt glucose targets between 6·1 mmol/L and 7·2 mmol/L (110–130 mg/dL) as needed |
| **Medtronic MiniMed 670/770G** | | |
| No RCT data available intrapartum on automatic mode; RCT data available 3–7 days onwards until 6 months postpartum[105,167] | No recommendation due to absence of evidence | Glucose target of 6·7 mmol/L (120 mg/dL, non-customisable); active insulin time of 2–3 h |
| **Medtronic MiniMed 780G** | | |
| RCT data available intrapartum and early postpartum[161] | Glucose target can most frequently remain at 5·5 mmol/L (99 mg/dL); increase as needed to a glucose target of 6·1 mmol/L or 6·7 mmol/L (110 mmol/L or 120 mg/dL); active insulin time of 2 h; increase insulin-to-carbohydrate ratios by at least 50% | Glucose target can most frequently remain at 5·5 mmol/L (99 mg/dL); increase as needed to a glucose target of 6·1 mmol/L or 6·7 mmol/L (110 mmol/L or 120 mg/dL); temporary target of 8·3 mmol/L (150 mg/dL) is rarely needed; active insulin time of 2 h; increase insulin-to-carbohydrate ratios by at least 50% (and an average increase by 80% is needed when breastfeeding) |
| **Omnipod 5 (SmartAdjust)** | | |
| No data available | No recommendation due to absence of evidence | Adapt glucose targets between 6·1 mmol/L and 8·3 mmol/L (110–150 mg/dL); might benefit from resetting the pump to prepregnancy settings or spending some time in manual mode before resuming automation |
| **Tandem t:slim X2 or Tandem Mobi with Control-IQ or Control-IQ+ technology** | | |
| Data available from a case series;[72,109] RCT ongoing[107] | Sleep activity range of 6·2–6·7 mmol/L (112–120 mg/dL) during labour and delivery | Sleep activity function can often be continued if postpartum profile is activated;* if frequent hypoglycaemia or fear of postpartum hypoglycaemia then Control-IQ without an activity target range of 6·2–8·8 mmol/L (112–160 mg/dL) can be used with sleep activity overnight or, if needed, temporary use of the exercise activity range of 7·7–8·8 mmol/L (140–160 mg/dL) can be used |
| **Sequel Twiist and open source systems (do-it-yourself APS—eg, Loop† and Android APS)** | | |
| Little data available; case reports | Set up two custom temporary overrides for delivery (50% and 75% of insulin needs, with a target of 5·5 mmol/L [99 mg/dL] enabled indefinitely) in advance, but do not activate until needed based on glucose, stage of labour, and mode of childbirth | Change target to 6·1–7·5 mmol/L (110–135 mg/dL) postpartum; continue temporary overrides until postpartum settings* are activated; if Android APS experience is very limited, consider the following setting adjustments: stop dynamic insulin sensitivity factor, reduce the maximum units per hour and maximum total insulin on board by around 25–50% compared with the pregnancy values, and reduce the so-called maximum allowed bolus by 25–50% |

AID=automated insulin delivery. APS=artificial pancreas system. RCT=randomised control trial. *For systems with setting-based algorithms (ie, Control-IQ, open source), basal rate, carbohydrate ratios, and insulin sensitivity settings should be weakened after delivery or immediately before delivery of the neonate (whichever is practical) to an individualised postpartum profile. The general principles for calculating an individualised postpartum profile are as follows: if prepregnancy pump settings were optimised and are known, then adjust all settings to be at least 20% weaker than the prepregnancy setting (more for breastfeeding). Alternatively, use settings that are at least 50% less aggressive than the end of pregnancy pump settings. For systems that have the option of multiple pump profiles (ie, Control-IQ, Android APS), users should programme a postpartum profile well in advance of delivery and activate it immediately after delivery. For systems (Loop 1·0–3·0) that do not have the option of multiple pump profiles, the postpartum profile will need to be programmed postpartum (basal rates, carbohydrate-to-insulin ratios, correction factors, and glucose targets). †The Loop algorithm is now commercially available with the Sequel Twiist system.

***Table 3:*** **Available data and suggested intrapartum and postpartum settings for the available AID systems**

versus SAP use.[76] In the PICLS study involving 23 women with type 1 diabetes, AID use was resumed 3–7 days postpartum, with a similar postpartum TIR of 3·9–10·0 mmol/L (70–180 mg/dL) between groups and a trend towards a lower TBR of less than 3·9 mmol/L (<70 mg/dL) with AID.[75] The AiDAPT extension trial continued CamAPS FX use throughout pregnancy, labour, birth, and up to 6 months postpartum, with a significantly improved TIR compared with intensive insulin therapy with CGM (72% with AID *vs* 54% with standard intensive therapy).[101] These studies support the continued use of AID postpartum (panel 1).[101] Suggestions for postnatal glucose targets and settings are shown in tables 1 and 3.

## Diabetes technology in type 2 diabetes during pregnancy

Women with pregestational type 2 diabetes reported higher rates of complications, such as pre-eclampsia, LGA, and small for gestational age neonates, as well as more congenital malformations and higher perinatal mortality compared with women without diabetes.[174] Pregnant women with type 2 diabetes also tend to be older, have higher BMI, and receive less frequent prepregnancy and antenatal care than women with pregestational type 1 diabetes.[3] Although women with type 2 diabetes can more often reach glycaemic targets compared with women with type 1 diabetes during pregnancy,[3] the rates of stillbirth and perinatal mortality are higher in type 2 diabetes, suggesting that lower glucose targets might be needed.[3] Non-glycaemic determinants, such as socioeconomic deprivation, pre-pregnancy BMI, coexistent medical conditions, and gestational weight gain should also be considered.

### Prepregnancy care in type 2 diabetes

For women with type 2 diabetes, a preconception $HbA_{1c}$ target of less than 6·5% (<48 mmol/mol) is recommended to reduce congenital anomalies; however, a pregnancy $HbA_{1c}$ target of less than 6·0% (<42 mmol/mol) might be more applicable to reduce the rates of perinatal mortality, pre-eclampsia, preterm birth, LGA, and neonatal intensive care unit admissions.[29,175] Therapies showing safety in pregnancy should preferentially be used, which means insulin is often needed to reach preconception glucose goals.[29] CGM can be a useful tool, as it is associated with a reduced $HbA_{1c}$, an increased TIR, and reduced hypoglycaemia in non-pregnant adults with type 2 diabetes.[176] In a pilot study,[177] preconception use of CGM in women with prediabetes or type 2 diabetes was associated with positive changes in weight and fitness and with an increased time between 3·9 and 7·8 mmol/L (70–140 mg/dL), although adequately powered studies in prepregnancy and pregnancy are urgently needed.

### Pregnancy care in type 2 diabetes

Evidence for the use of CGM during type 2 diabetes pregnancy is currently scarce, with no substantive RCT data. Ongoing RCTs are examining the efficacy of CGM in women with type 2 diabetes (ISRCTN12804317 and NCT06628453). Three RCTs comparing CGM with SMBG during pregnancy have included few women with type 2 diabetes alongside women with type 1 diabetes and gestational diabetes.[178–180] All of the studies used older CGM systems episodically, and in one study, participants were masked to CGM data. Statistical power to evaluate the effectiveness of CGM in type 2 diabetes pregnancy was lacking in these studies.

In a retrospective observational study comparing 82 pregnant women with type 2 diabetes who used CGM versus 278 who did not, CGM users had reduced odds of a composite neonatal adverse outcome, of preterm birth, and of neonatal intensive care unit admissions.[181] A pilot study in Australia showed that the use of intermittently scanned CGM is feasible in remote and diverse populations (75% Aborigines or Torres Strait Islander) with type 2 diabetes pregnancy (n=57), but with variable sensor usage.[182] In women with more than 50% use of CGM, each 1% increase in TIR was associated with a 4–5% reduction in the rates of neonatal complications.[183]

Large-scale, adequately powered trials of CGM use in pregnancy complicated by type 2 diabetes and studies assessing the relationship between CGM metrics and type 2 diabetes pregnancy outcomes are needed, including studies on the use of AID systems or connected insulin smart pens in type 2 diabetes pregnancies. Women with type 2 diabetes generally have lower $HbA_{1c}$ during pregnancy than women with type 1 diabetes, yet the rates of stillbirth and perinatal mortality are higher than those in type 1 diabetes.[3] Glucose is the single most important modifiable factor influencing these outcomes, suggesting that an increased TIRp might be needed for women with type 2 diabetes to improve these outcomes. As women with type 2 diabetes are increasingly using CGM before pregnancy, and often become pregnant while using CGM, the expert consensus recommendation is that CGM can be offered to women with type 2 diabetes during pregnancy (panel 2), based on available resources and individual preference. A high TIRp (>80%; panel 2) is suggested in pregnancy based on expert opinion, acknowledging the scarcity of solid evidence (level E evidence).

### Care during labour and delivery in type 2 diabetes

Research is needed to identify the target glucose ranges during labour in women with type 2 diabetes, and to understand the impact of the use of diabetes technologies during labour in type 2 diabetes. As in type 1 diabetes, the decision to continue the use of any technologies during childbirth should be individualised, discussed with the mother, and determined before labour begins, considering the previous experience of the health-care team within the hospital setting and the knowledge and experience of the mother.[161]

### Postpartum care in type 2 diabetes

Data are especially needed to establish how diabetes technologies can help to avoid hypoglycaemia postpartum and can reduce the risk of neonatal hypoglycaemia. Despite the scarcity of data on optimising technology use postpartum for women with type 2 diabetes,[185] we suggest optimising the TIR to 3·9–10·0 mmol/L (70–180 mg/dL, similar to other non-pregnant women with type 1 diabetes) in the immediate postnatal period, while establishing breastfeeding and adapting to new routines.[156] The use of CGM could enhance glycaemia in this period by facilitating the attainment of a TIR of more than 70%.[186]

## Diabetes technology in gestational diabetes

Gestational diabetes is generally defined as hyperglycaemia, first detected during pregnancy, provided that overt diabetes has been excluded.[187] It is the most common medical complication of pregnancy, with a global prevalence of 14%.[188] Gestational diabetes is associated with increased risks of perinatal complications compared with women without hyperglycaemia, including pre-eclampsia, LGA, neonatal hypoglycaemia, and greater long-term maternal and offspring risks of type 2 diabetes and cardiovascular disease.[189] Gestational diabetes results from a chronic defect in β-cell compensation detected by routine glucose testing in pregnancy; however, the causes are varied, similar to diabetes outside of pregnancy.[190]

Management of gestational diabetes includes medical nutrition therapy with pharmacotherapy (generally insulin, or in some cases, metformin) if required and counselling on health-promoting behaviours to reach maternal glucose goals, alongside obstetric surveillance to monitor fetal growth.[189] A 2021 systematic review and meta-analysis of 3982 women reported that treatment for gestational diabetes diagnosed at 24–28 weeks gestation is associated with a lower risk of primary caesarean deliveries, macrosomia, LGA births, shoulder dystocia, birth injury, and admission to neonatal intensive care units compared with women with gestational diabetes who were not treated.[191] To date, a single treatment trial of early gestational diabetes exists, showing that early diagnosis and treatment in women before 20 weeks gestation modestly reduced the risk of a composite of serious perinatal complications (driven almost entirely by reduced neonatal respiratory distress) compared with deferred treatment.[192]

### Care during gestational diabetes

Evidence supporting specific SMBG-derived glucose targets in gestational diabetes is limited. The TARGET trial involving 1100 women showed a similar rate of LGA births for tighter targets, with an FPG of 5·0 mmol/L or less (≤90 mg/dL), 1-h postprandial of 7·4 mmol/L or less (≤133 mg/dL), 2-h postprandial of 6·7 mmol/L or less (≤120 mg/dL) versus less tight targets (FPG <5·5 mmol/L [<99 mg/dL], 1-h postprandial <8·0 mmol/L [<144 mg/dL]), and 2-h postprandial <7·0 mmol/L [<126 mg/dL]).[193] Tighter targets did not reduce the risk of LGA infants, but were associated with a lower risk of a composite outcome of perinatal death, birth trauma, or shoulder dystocia. An increase in maternal haemorrhage, coagulopathy, embolism, and obstetric complications was balanced against these benefits.[193]

A 2023 Cochrane review reported low-certainty evidence that tighter glycaemic management (FPG ≤5·0 mmol/L or ≤5·1 mmol/L [≤90 mg/dL or ≤92 mg/dL] and PPG ≤6·7 mmol/L or ≤7·4 mmol/L [≤ 120 mg/dL and ≤133 mg/dL]) was potentially associated with reduced neonatal risk of death or severe infant morbidity, compared with less tight glycaemic management (FPG ≤5·3 mmol/L or ≤5·8 mmol/L [≤95 mg/dL or ≤104 mg/dL] and PPG ≤7·8 mmol/L or ≤8·0 mmol/L [≤140 mg/dL or ≤144 mg/dL])[194] but came with an increased maternal risk of hypertensive disorders of pregnancy. A systematic review of 34 observational studies (9433 women) reported that a FPG target of less than 5·0 mmol/L (<90 mg/dL) was associated with less

***Panel 2:*** **Recommendations for using diabetes technology in pregnant women with type 2 diabetes and those planning pregnancy or women with gestational diabetes**

Each of the recommendations in this consensus has been assigned a level of supporting evidence (ie, A, B, C, or E) that adheres to the evidence-grading system of the American Diabetes Association Standards of Medical Care in Diabetes (appendix p 5).[29]

**Type 2 diabetes in pregnancy**

- Capillary blood glucose testing is recommended for all women with type 2 diabetes before and during pregnancy, along with education to reinforce consistent use (A).
- Based on the evidence of continuous glucose monitoring (CGM) use in non-pregnant type 2 diabetes populations, CGM can be used in preparation for pregnancy to help women with type 2 diabetes reach glycaemic targets (B).[176,65,184]
- CGM can be offered to women with type 2 diabetes during pregnancy, based on available resources and individual preferences, but little evidence of improved outcomes with CGM during type 2 diabetes pregnancy exists (E). Evidence to determine CGM metrics associated with optimal pregnancy outcomes for women with type 2 diabetes is insufficient. When CGM is used during type 2 diabetes pregnancy, a target of >80% time in range in pregnancy (TIRp)—ie, 3·5–7·8 mmol/L (63–140 mg/dL)—might be applicable, with <4% below 3·5 mmol/L (63 mg/dL) and <15% above 7·8 mmol/L (140 mg/dL); however, the most appropriate targets are unknown (E).

**Gestational diabetes**

- Capillary blood glucose testing is recommended for all women with gestational diabetes, along with education to reinforce consistent use (A).
- CGM can be offered to women with gestational diabetes* based on available resources and individual preferences, although evidence for improved outcomes is scarce (E).
- Evidence to determine CGM metrics associated with optimal pregnancy outcomes for women with gestational diabetes is insufficient. When using CGM in gestational diabetes, a target of >90% TIRp—ie, 3·5–7·8 mmol/L (63–140 mg/dL)—might be suggested (E); however, the most appropriate targets are unknown (E).

*People using CGM devices should also always have access to blood glucose meters (BGMs). People who are taking insulin and using BGMs should be encouraged to check their blood glucose concentrations when appropriate, based on their insulin therapy.

macrosomia, LGA births, neonatal hypoglycaemia, neonatal jaundice, and pre-eclampsia for women with gestational diabetes, again with a low certainty of evidence.[195] Although $HbA_{1c}$ is positively associated with perinatal complications in gestational diabetes,[196] the clinical utility of $HbA_{1c}$ in gestational diabetes is limited, since specific $HbA_{1c}$ thresholds do not have the sensitivity for predicting complications.[197–199]

***Panel 3:* Priorities for future research**

**Type 1 diabetes**

- More evidence is needed on whether automated insulin delivery (AID) systems can improve maternal and neonatal pregnancy outcomes. Data from large national audits, registries, or meta-analyses could provide more information on pregnancy complications since the introduction of AID systems.
- More research is needed to establish whether the current proposed consensus glucose targets for pregnancy are adequate, should differ according to the trimester, or should be lower overnight compared with daytime.
- More data are needed to determine the most appropriate continuous glucose monitoring (CGM) glycaemic targets at preconception to improve pregnancy outcomes.
- More evidence is needed on the most appropriate target for mean glucose in pregnancy, as this metric might help to further improve pregnancy outcomes.
- More research is needed on the timing of the bolus when AID systems are used in pregnancy.

**Type 2 diabetes**

- Data are needed on what glycaemic targets should be used at preconception and during pregnancy to optimise pregnancy outcomes in women with type 2 diabetes.
- Large studies adequately powered on pregnancy outcomes are needed to establish whether the use of CGM can reduce the risk of pregnancy complications in women with type 2 diabetes.
- Studies that investigate the relationship between CGM metrics and type 2 diabetes pregnancy outcomes are needed.
- Research is needed to identify target glucose ranges during labour in women with type 2 diabetes, and to understand the impact of using diabetes technology during labour in type 2 diabetes.
- Data are needed on how to optimise diabetes technology use postpartum for women with type 2 diabetes.
- Large studies are needed to assess the use of AID systems or connected insulin pens in type 2 diabetes pregnancies.

**Gestational diabetes**

- Understanding the value of CGM in the screening, diagnosis, and management of gestational diabetes is needed.
- Recommended CGM treatment targets for routine management of gestational diabetes need to be determined.
- Adequately powered studies on pregnancy outcomes are needed to establish whether the use of CGM can reduce the risk of pregnancy complications in women with gestational diabetes, including in early gestational diabetes.
- Research is needed to identify target glucose ranges during labour in women with gestational diabetes.
- More data are needed to establish whether CGM can be useful postpartum to screen for glucose intolerance (and whether it can replace the burden of the oral glucose tolerance test) and to identify who is at the highest risk of developing an adverse metabolic profile in the long term.

## CGM metrics for monitoring glycaemia during gestational diabetes

Insufficient evidence exists for the use of CGM in the management of women with gestational diabetes; therefore, SMBG is the standard of care for glucose management in gestational diabetes (panel 2). A 2017 Cochrane review reported less gestational weight gain with CGM versus SMBG (mean difference –1·26 kg), based on low-certainty evidence.[200] A 2022 review of six trials (482 women) found similar benefits of CGM on gestational weight gain and an improvement in $HbA_{1c}$ and birthweight, based on low-certainty evidence.[201] A meta-analysis suggested that episodic use of CGM in gestational diabetes was associated with improved third trimester $HbA_{1c}$ and reduced LGA births.[202] The outcomes of the GRACE open-label RCT,[203] reported that 170 women diagnosed with gestational diabetes and assigned to use CGM had fewer LGA newborns compared with 175 women with gestational diabetes in the SMBG control group (3·5% *vs* 10·3%; p=0·014). The CGM group also had improved time in tight range (3·8–7·8 mmol/L (70–140 mg/dL). Further, adequately powered studies are needed to establish the clinical efficacy of CGM therapy in gestational diabetes (panel 3).

Recommended TIR targets for management of gestational diabetes still need to be determined. Although women with gestational diabetes can achieve a higher TIRp than women with type 1 diabetes, it does not appear to translate into reduced LGA births[202,204–207] or improvements in other perinatal outcomes.[208–210] Mean sensor glucose—a marker of average glucose concentrations—is associated with excess fetal growth in gestational diabetes.[202,204–207,211] A cohort study of 1302 women in China with gestational diabetes found mean sensor glucose and TARp to be associated with a composite outcome of preterm births, LGA births, fetal distress, premature rupture of membranes, and neonatal intensive care unit admission.[206] Additionally, TIRp, TARp, area under curve, mean amplitude of glycaemic excursion, and mean sensor glucose were positively associated with LGA births, whereas TBRp was inversely associated with LGA births.[206] However, the characteristics of these women (such as low BMI) are not representative of wider gestational diabetes cohorts, and mean sensor glucose concentrations were low even for women at the highest risk of complications.[206] In a secondary analysis of the DiGest RCT with a limited sample of 361 women with gestational diabetes,[212] a mean glucose concentration of less than 6·1 mmol/L (< 110 mg/dL) was suggested as a therapeutic target for the management of gestational diabetes. Evidence to suggest a mean glycaemia target for gestational diabetes is insufficient.

Several large RCTs powered on pregnancy outcomes and comparing CGM with SMBG in gestational diabetes are ongoing or have been completed.[5] The first large RCT powered on pregnancy outcomes, namely the DipGluMo trial,[213] did not show an improvement in maternal

complications or perinatal outcomes in 156 women with CGM compared with the use of SMBG in 143 women with gestational diabetes. The TIRp was slightly higher with SMBG compared with CGM (96·9% *vs* 92·2%) later in pregnancy, although women preferred using CGM.[213,214] A 2025 single-centre RCT in 111 participants with gestational diabetes, which was not powered on pregnancy outcomes, reported a higher TIRp in the CGM group compared with SMBG (93% [SD 6] *vs* 88% [SD 14]), taking into account the low compliance with SMBG in the control group.[215]

Since clear evidence for CGM is scarce, SMBG is the standard of care for the management of gestational diabetes. However, based on expert opinion, CGM can be offered to women with gestational diabetes based on available resources and individual preferences, although evidence for improved perinatal outcomes is lacking. Acknowledging the scarcity of strong evidence, a suggestion based on expert opinion is made—in line with international consensus targets[37]—that if CGM is used in gestational diabetes, a target TIRp of more than 90% and a TARp of less than 10% could be used (level E; panel 2). RCTs evaluating the use of CGM in women with gestational diabetes are urgently needed, including CGM treatment targets and associations with perinatal outcomes.

### CGM in the diagnosis of gestational diabetes

A large prospective observational study, Glucose Levels Across Maternity (GLAM), examined the association of CGM-derived glycaemic patterns with perinatal outcomes in a cohort of 768 women enrolled before 17 weeks gestation.[216] Gestational diabetes was diagnosed with an oral glucose tolerance test (OGTT) at 24–28 weeks gestation. CGM-measured glucose values were slightly higher than OGTT-based glucose concentrations.[217] The GLAM study showed an increased mean sensor glucose of 6·4 mmol/L (SD 1·2) versus 5·8 mmol/L (SD 1·0; 115 mg/dL [SD 22] *vs* 104 mg/dL [SD 18]) and a decreased TIRp (84% *vs* 94%) from 13 weeks to 14 weeks gestation in women subsequently diagnosed with gestational diabetes at 24–28 weeks gestation.[218] A second trimester TARp of more than 7·8 mmol/L (>140 mg/dL) best predicted gestational diabetes at 24–28 weeks gestation, with an area under the receiver-operating characteristic curve of 0·81.[218,219] The ongoing observational study Glycaemic Observation and Metabolic Outcomes in Mothers and Offspring study (GO MOMs) will provide further insights into early pregnancy glycaemia and comparisons between CGM and OGTT data.[168]

### CGM-derived thresholds for identifying gestational diabetes based on outcome associations

The GLAM study also showed positive associations between CGM glucose metrics and pregnancy complications.[216] LGA births and hypertensive disorders of pregnancy were associated with slightly higher mean sensor glucose (5·7 mmol/L [102 mg/dL] *vs* 5·6 mmol/L [100 mg/dL] for LGA [p=0·01] and 5·7 mmol/L [102 mg/dL] *vs* 5·5 mmol/L [99 mg/dL] for hypertensive disorders [p<0·001]). Percentage time more than 6·7 mmol/L (>120 mg/dL) and more than 7·8 mmol/L (>140 mg/dL) were also positively associated with LGA births and hypertensive disorders of pregnancy, respectively.[208,218] However, the absolute difference in mean sensor glucose in women with and without perinatal complications was small, highlighting the difficulty of defining clinical treatment thresholds.

### Intrapartum care in gestational diabetes

No studies have evaluated CGM targets during labour and delivery in women with gestational diabetes. The American College of Obstetricians and Gynecologists recommends 6·1 mmol/L (110 mg/dL) as the upper glucose target for intrapartum glucose for women with gestational diabetes.[220] Most data supporting these targets are derived from studies on women with pre-existing diabetes rather than gestational diabetes.[155–157]

Women with gestational diabetes on high doses of insulin might require increased glucose monitoring and active insulin dose titration. However, an RCT on intrapartum management in 76 women with gestational diabetes,[54] comparing tight (hourly glucose testing and treatment if glucose is <3·3 mmol/L [<60 mg/dL] or >5·6 mmol/L [>100 mg/dL]) versus liberal targets (4-h glucose measurement and treatment if glucose is <3·3 mmol/L [<60 mg/dL] or >6·7 mmol/L [>120 mg/dL]) showed no difference in initial neonatal glucose concentrations, but lower mean neonatal glucose concentrations with tight glycaemic management in the first 24 h.[54]

### Postpartum glucose in gestational diabetes

Most women can stop pharmacotherapy after delivery. Checking the postpartum blood glucose concentrations before discharge from hospital is useful to identify women with persisting diabetes in need of pharmacological management at discharge. However, no clear consensus exists on what test to do in the immediate postpartum period. OGTT is ideally carried out 6–12 weeks postpartum to assess glycaemic status,[29] but is often not conducted. Data are scarce on the use of CGM in the postpartum period to help identify women who are at higher risk of progression to diabetes, but studies are underway (NCT04972955).

## Strengths and limitations

The consensus process and method that was used has strengths and limitations. Strengths include the international composition of the consensus panel and the considerable expertise reflected in the participants. Opinion leaders were represented from academic institutions, hospitals, and various diabetes, obstetric, and primary care associations globally. The patient voice was also represented. The nominal group technique

method was a strength, allowing each participant the opportunity to contribute at several points in the development of the consensus, such that all voices were able to contribute effectively. Limitations included that the selection of the consensus panel was not systematised or in any way randomised—rather it was founded in their clinical experience in the application of diabetes technology in pregnancy complicated by diabetes. This selection process might have introduced bias. A further limitation is that the literature database searches were largely based on publications in English and relied on published studies, rather than a wider investigation of case-based and non-English language resources.

## Conclusion

Strong evidence exists that CGM and AID can help women with type 1 diabetes to meet glycaemic targets during pregnancy and in the postpartum period. More evidence is needed to establish whether AID can also improve pregnancy outcomes. The evidence on CGM use in pregnant women with type 2 diabetes or gestational diabetes is limited, but preliminary observations indicate a potential for benefits, and larger RCTs are ongoing. More evidence is needed regarding the CGM glycaemic metrics and targets that should be recommended in pregnant women with type 2 diabetes and gestational diabetes. An extended summary of the gaps in evidence and priorities for future research is provided in panel 3. Manufacturers of diabetes technologies should address their reporting systems to accommodate pregnancy-specific targets. Despite evidence supporting the application of diabetes technology in pregnancy with diabetes, inequity in the provision of CGM and AID systems during pregnancy persists, and intervention to improve access and health literacy in the use of diabetes technologies for healthier maternal and neonatal outcomes is needed.

### Search strategy and selection criteria

We did a comprehensive literature search on MEDLINE, PubMed, and the Cochrane Library for articles published between Jan 1, 2008 (when the first data on CGM in pregnancy became available), and Oct 25, 2025 (appendix pp 2–3). The following search terms were used: "randomised controlled trial", "randomised clinical trial", "real world study", "observational study", "cohort study", "continuous glucose monitoring", "CGM", "CGM metrics", "intermittently scanned continuous glucose monitoring", "isCGM", "flash glucose monitoring", "time in range", "time below range", "time above range", "insulin pumps", "sensor-augmented pump therapy", "closed-loop therapy", "closed-loop insulin delivery", "CSII", "automated insulin delivery", "HbA1c", "GMI", "glycaemic control", "hypoglycaemia", "glycaemic variability", "predictive low glucose suspend", "pregnancy outcomes", "pregnancy complications", "delivery", "intrapartum", "breastfeeding", "postpartum", and "cost-effectiveness" in combination with the terms "pregnancy" and "diabetes". Randomised control trials, real-world studies, observational studies, and cohort studies were included. If no other evidence was available, case reports and case series were also considered: otherwise, these were excluded. Only studies performed in humans and published in English were considered. The PRISMA flow diagram for the search process is shown in the appendix (p 4).

**Contributors**

All authors contributed equally to all aspects of the consensus process, both as participants in working groups framing the narrative and evidence base for type 1 diabetes, type 2 diabetes, or gestational diabetes, and for general discussion. As such, all authors participated in providing feedback on 24 serial drafts of the final manuscript. All authors have given their approval for this version to be published. KB, JH, ML, and HRM are the guarantors of this work and take full responsibility for the work as a whole.

**Declaration of interests**

KB has received consulting fees from AstraZeneca and Eli Lilly; speakers fees from Novo Nordisk, AstraZeneca, and Mundipharma Medtronic; support for attending meetings or for travel from AstraZeneca and Novo Nordisk; grants or contracts from Medtronic, Novo Nordisk, Eli Lilly, AstraZeneca, Metagenics, and Abbott; has received equipment, materials, or drugs from Medtronic, Dexcom, Novo Nordisk, Abbott, and Lifescan; and is the recipient of a Senior Fellowship of The Flemish Research Foundation (1800225N). CD has received research funding from Dexcom, Abbott, and the Helmsley Charitable Trust; and has sat on data safety monitoring boards or advisory boards for Abbott and Dexcom. DA has received payment or honoraria from Abbott Diabetes Care and the diaTribe Foundation; and has declared a leadership or fiduciary role at DeDoc. AA has received grants or contracts from the National Institutes of Health (NIH), Breakthrough T1D, and the Helmsley Charitable Trust; has received payment or honoraria from the American Diabetes Association (ADA) and Breakthrough T1D; has received support for attending meetings or for travel from the International Society for Pediatric and Adolescent Diabetes, Advanced Technologies and Treatments for Diabetes (ATTD) conference, and ADA; and has declared a leadership or fiduciary role at ADA Health Disparities and T1Dx-QI. TB has served on advisory panels for Novo Nordisk, Sanofi, Eli Lilly, AstraZeneca, Medtronic, Abbott, and Roche; has received honoraria for participating in speaker bureaus from Eli Lilly, Novo Nordisk, Medtronic, Abbott, Sanofi, Dexcom, Aventis, AstraZeneca, and Roche; has received research grant support to their institution from Abbott, Medtronic, Novo Nordisk, Sanofi, Novartis, Sandoz, Zealand Pharma, the Slovenian Research and Innovation Agency, the NIH, BreakthroughT1D, the Helmsley Foundation, and the European Union. RMB has received research support, has acted as a consultant, or has sat on the scientific advisory board for Abbott Diabetes Care, Ascensia, DexCom, Eli Lilly, Embecta, Insulet, Medtronic, Novo Nordisk, Roche Diabetes Care, Tandem Diabetes Care, and Sanofi; and their employer—non-profit HealthPartners Institute—contracts for his services: he receives no personal income from these activities. AC has acted as a consultant or has sat on the scientific advisory board for Novo Nordisk, Insulet, MannKind, and Zealand; and has declared clinical research investigator status for Novo Nordisk, Medtronic/Companion Medical, Insulet, Sanofi, Dexcom, Abbott, Eli Lilly, UnitedHealth, and Tandem Diabetes. LED has received research grant funding for investigator-initiated research from Diabetes Canada, Major Sciences Initiatives Competition, and the Alberta Diabetes Institute; has received research funding for investigator-initiated research from the Calgary Health Trust; was a speaker for Dexcom, but declares that the payment was made to their institution; and has received, at reduced cost, a loan of equipment from Dexcom, Tandem Diabetes Care, Medtronic, and Inter-analytics for investigator-initiated research funded by non-profit competitive funding agencies. DRF declares that their employer received consulting fees and payment

or honoraria from Embecta, Eli Lilly, Novo Nordisk, Abbott, and Medtronic; declares that Embecta, Eli Lilly, Novo Nordisk, and Abbott paid their employer for sitting on a data safety monitoring board or advisory board; and received support for attending meetings or for travel from Novo Nordisk. DI has received payment or honoraria from Dexcom, Abbott, Sanofi, Novo Nordisk, Insulet, Tandem, Eli Lilly, Sequel, and Medtronic. 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**References**

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

2 Benhalima K, Beunen K, Siegelaar SE, et al. Management of type 1 diabetes in pregnancy: update on lifestyle, pharmacological treatment, and novel technologies for achieving glycaemic targets. *Lancet Diabetes Endocrinol* 2023; **11:** 490–508.

3 Murphy HR, Howgate C, O'Keefe J, et al, and the National Pregnancy in Diabetes (NPID) advisory group. Characteristics and outcomes of pregnant women with type 1 or type 2 diabetes: a 5-year national population-based cohort study. *Lancet Diabetes Endocrinol* 2021; **9:** 153–64.

4 Landon MB, Spong CY, Thom E, et al, and the Eunice Kennedy Shriver National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network. A multicenter, randomized trial of treatment for mild gestational diabetes. *N Engl J Med* 2009; **361:** 1339–48.

5 Benhalima K, Yamamoto JM. Use of continuous glucose monitoring and hybrid closed-loop therapy in pregnancy. *Diabetes Obes Metab* 2024; **26** (suppl 7): 74–91.

6 Gribble KD, Bewley S, Bartick MC, et al. Effective communication about pregnancy, birth, lactation, breastfeeding and newborn care: the importance of sexed language. *Front Glob Womens Health* 2022; **3:** 818856.

7 Logullo P, van Zuuren EJ, Winchester CC, et al. ACcurate COnsensus Reporting Document (ACCORD) explanation and elaboration: guidance and examples to support reporting consensus methods. *PLoS Med* 2024; **21:** e1004390.

8 Van de Ven AH, Delbecq AL. The nominal group as a research instrument for exploratory health studies. *Am J Public Health* 1972; **62:** 337–42.

9 Hill-Briggs F, Adler NE, Berkowitz SA, et al. Social determinants of health and diabetes: a scientific review. *Diabetes Care* 2021; **44:** 258–79.

10 Solar O, Irwin A. A conceptual framework for action on the social determinants of health. Social determinants of health discussion paper 2 (Policy and Practice). 2010. https://www.afro.who.int/sites/default/files/2017–06/SDH_conceptual_framework_for_action.pdf (accessed Oct 24, 2025).

11 Ogunwole SM, Golden SH. Social determinants of health and structural inequities—root causes of diabetes disparities. *Diabetes Care* 2021; **44:** 11–13.

12 Conway RB, Snell-Bergeon J, Honda-Kohmo K, et al. Disparities in diabetes technology uptake in youth and young adults with type 1 diabetes: a global perspective. *J Endocr Soc* 2025; **9:** bvae210.

13 Ewen M, Lepeska M, Abdraimova A, et al. Availability, prices and affordability of self-monitoring blood glucose devices: surveys in six low-income and middle-income countries. *BMJ Public Health* 2025; **3:** e001128.

14 Addala A, Auzanneau M, Miller K, et al. A decade of disparities in diabetes technology use and $HbA_{1c}$ in pediatric type 1 diabetes: a transatlantic comparison. *Diabetes Care* 2021; **44:** 133–40.

15 Agarwal S, Kanapka LG, Raymond JK, et al. Racial-ethnic inequity in young adults with type 1 diabetes. *J Clin Endocrinol Metab* 2020; **105:** e2960–69.

16 Willi SM, Miller KM, DiMeglio LA, et al, and the T1D Exchange Clinic Network. Racial-ethnic disparities in management and outcomes among children with type 1 diabetes. *Pediatrics* 2015; **135:** 424–34.

17 Auzanneau M, Lanzinger S, Bohn B, et al, and the DPV Initiative. Area deprivation and regional disparities in treatment and outcome quality of 29,284 pediatric patients with type 1 diabetes in Germany: a cross-sectional multicenter DPV analysis. *Diabetes Care* 2018; **41:** 2517–25.

18 Lado JJ, Lipman TH. Racial and ethnic disparities in the incidence, treatment, and outcomes of youth with type 1 diabetes. *Endocrinol Metab Clin North Am* 2016; **45:** 453–61.

19 Lai CW, Lipman TH, Willi SM, Hawkes CP. Racial and ethnic disparities in rates of continuous glucose monitor initiation and continued use in children with type 1 diabetes. *Diabetes Care* 2021; **44:** 255–57.

20 Valenzuela JM, La Greca AM, Hsin O, Taylor C, Delamater AM. Prescribed regimen intensity in diverse youth with type 1 diabetes: role of family and provider perceptions. *Pediatr Diabetes* 2011; **12:** 696–703.

21 Addala A, Ding V, Zaharieva DP, et al, and the Teamwork, Targets, Technology, and Tight Control (4T) Study Group. Disparities in hemoglobin $A_{1c}$ levels in the first year after diagnosis among youths with type 1 diabetes offered continuous glucose monitoring. *JAMA Netw Open* 2023; **6:** e238881.

22 Fisher PM, Sutherland HW, Bewsher PD. The insulin response to glucose infusion in normal human pregnancy. *Diabetologia* 1980; **19:** 15–20.

23 Buchanan TA, Metzger BE, Freinkel N, Bergman RN. Insulin sensitivity and B-cell responsiveness to glucose during late pregnancy in lean and moderately obese women with normal glucose tolerance or mild gestational diabetes. *Am J Obstet Gynecol* 1990; **162:** 1008–14.

24 Ryan EA, O'Sullivan MJ, Skyler JS. Insulin action during pregnancy. Studies with the euglycemic clamp technique. *Diabetes* 1985; **34:** 380–89.

25 Catalano PM, Tyzbir ED, Roman NM, Amini SB, Sims EAH. Longitudinal changes in insulin release and insulin resistance in nonobese pregnant women. *Am J Obstet Gynecol* 1991; **165:** 1667–72.

26 Diguisto C, Strachan MWJ, Churchill D, Ayman G, Knight M. A study of diabetic ketoacidosis in the pregnant population in the United Kingdom: investigating the incidence, aetiology, management and outcomes. *Diabet Med* 2022; **39:** e14743.

27 Villavicencio CA, Franco-Akel A, Belokovskaya R. Diabetic ketoacidosis complicating gestational diabetes mellitus. *AACE Clin Case Rep* 2022; **8:** 221–23.

28 Durnwald C, Polsky S. Continuous ketone monitoring in pregnancy. *Diabetes Technol Ther* 2025; published online July 9. https://doi.org/10.1089/dia.2025.0300.

29 American Diabetes Association Professional Practice Committee. 15. Management of diabetes in pregnancy: standards of care in diabetes—2025. *Diabetes Care* 2025; **48** (suppl 1): s306–20.

30 Dingena CF, Arofikina D, Campbell MD, Holmes MJ, Scott EM, Zulyniak MA. Nutritional and exercise-focused lifestyle interventions and glycemic control in women with diabetes in pregnancy: a systematic review and meta-analysis of randomized clinical trials. *Nutrients* 2023; **15:** 323.

31 Yamamoto JM, Kellett JE, Balsells M, et al. Gestational diabetes mellitus and diet: a systematic review and meta-analysis of randomized controlled trials examining the impact of modified dietary interventions on maternal glucose control and neonatal birth weight. *Diabetes Care* 2018; **41:** 1346–61.

32 Brown J, Ceysens G, Boulvain M. Exercise for pregnant women with gestational diabetes for improving maternal and fetal outcomes. *Cochrane Database Syst Rev* 2017; **6:** CD012202.

33 Cremona A, O'Gorman C, Cotter A, Saunders J, Donnelly A. Effect of exercise modality on markers of insulin sensitivity and blood glucose control in pregnancies complicated with gestational diabetes mellitus: a systematic review. *Obes Sci Pract* 2018; **4:** 455–67.

34 Battarbee AN, Durnwald C, Yee LM, Valent AM. Continuous glucose monitoring for diabetes management during pregnancy: evidence, practical tips, and common pitfalls. *Obstet Gynecol* 2024; **144:** 649–59.

35 Bergenstal RM, Ahmann AJ, Bailey T, et al. Recommendations for standardizing glucose reporting and analysis to optimize clinical decision making in diabetes: the ambulatory glucose profile. *J Diabetes Sci Technol* 2013; **7:** 562–78.

36 Simonson GD, Criego AB, Battelino T, et al. Expert panel recommendations for a standardized ambulatory glucose profile report for connected insulin pens. *Diabetes Technol Ther* 2024; **26:** 814–22.

37 Battelino T, Danne T, Bergenstal RM, et al. Clinical targets for continuous glucose monitoring data interpretation: recommendations from the international consensus on time in range. *Diabetes Care* 2019; **42:** 1593–603.

38 Eichenlaub M, Waldenmaier D, Wehrstedt S, et al. Performance of three continuous glucose monitoring systems in adults with type 1 diabetes. *J Diabetes Sci Technol* 2025; published online Feb 4. https://doi.org/10.1177/19322968251315459.

39 Freckmann G, Wehrstedt S, Eichenlaub M, et al. A comparative analysis of glycemic metrics derived from three continuous glucose monitoring systems. *Diabetes Care* 2025; **48:** 1213–17.

40 Klonoff DC, Gabbay M, Moon SJ, Wilmot EG. Importance of FDA-integrated continuous glucose monitors to ensure accuracy of continuous glucose monitoring. *J Diabetes Sci Technol* 2024; **19:** 1392–99.

41 Mathieu C, Irace C, Wilmot EG, et al. Minimum expectations for market authorization of continuous glucose monitoring devices in Europe—'eCGM' compliance status. *Diabetes Obes Metab* 2025; **27:** 1025–31.

42 Grinberg K, Yisaschar-Mekuzas Y. Assessing mental health conditions in women with gestational diabetes compared to healthy pregnant women. *Healthcare* 2024; **12:** 1438.

43 Delanerolle G, Phiri P, Zeng Y, et al. A systematic review and meta-analysis of gestational diabetes mellitus and mental health among BAME populations. *eClinicalMedicine* 2021; **38:** 101016.

44 Salimi HR, Griffiths MD, Alimoradi Z. Prevalence of anxiety and depression among pregnant women with diabetes and their predictors. *Diabetes Epidemiol Manag* 2024; **14:** 100198.

45 Nazarpour S, Simbar M, Kiani Z, Khalaji N, Khorrami Khargh M, Naeiji Z. The relationship between quality of life and some mental problems in women with gestational diabetes mellitus (GDM): a cross-sectional study. *BMC Psychiatry* 2024; **24:** 511.

46 Cobry EC, Karami AJ, Meltzer LJ. Friend or foe: a narrative review of the impact of diabetes technology on sleep. *Curr Diab Rep* 2022; **22:** 283–90.

47 Lin YK, Hepworth E, de Zoysa N, et al. Relationships of hypoglycemia awareness, hypoglycemia beliefs, and continuous glucose monitoring glycemic profiles with anxiety and depression symptoms in adults with type 1 diabetes using continuous glucose monitoring systems. *Diabetes Res Clin Pract* 2024; **209:** 111596.

48 Gilbert TR, Noar A, Blalock O, Polonsky WH. Change in hemoglobin $A_{1c}$ and quality of life with real-time continuous glucose monitoring use by people with insulin-treated diabetes in the landmark study. *Diabetes Technol Ther* 2021; **23:** s35–39.

49 Pickup JC, Ford Holloway M, Samsi K. Real-time continuous glucose monitoring in type 1 diabetes: a qualitative framework analysis of patient narratives. *Diabetes Care* 2015; **38:** 544–50.

50 Nana M, Moore SL, Ang E, Lee ZX, Bondugulapati LNR. Flash glucose monitoring: impact on markers of glycaemic control and patient-reported outcomes in individuals with type 1 diabetes mellitus in the real-world setting. *Diabetes Res Clin Pract* 2019; **157:** 107893.

51 Pinsker JE, Müller L, Constantin A, et al. Real-world patient-reported outcomes and glycemic results with initiation of Control-IQ technology. *Diabetes Technol Ther* 2021; **23:** 120–27.

52 Thorius IH, Petersen J, Husemoen LLN, et al. Glycemic control and risk of congenital malformations in women with type 1 diabetes. *Obstet Gynecol* 2024; **144:** 725–32.

53 Glinianaia SV, Tennant PWG, Bilous RW, Rankin J, Bell R. $HbA_{1c}$ and birthweight in women with pre-conception type 1 and type 2 diabetes: a population-based cohort study. *Diabetologia* 2012; **55:** 3193–203.

54 Hamel MS, Kanno LM, Has P, Beninati MJ, Rouse DJ, Werner EF. Intrapartum glucose management in women with gestational diabetes mellitus: a randomized controlled trial. *Obstet Gynecol* 2019; **133:** 1171–77.

55 Wahabi HA, Alzeidan RA, Esmaeil SA. Pre-pregnancy care for women with pre-gestational diabetes mellitus: a systematic review and meta-analysis. *BMC Public Health* 2012; **12:** 792.

56 Lemaitre M, Ternynck C, Bourry J, Baudoux F, Subtil D, Vambergue A. Association between $HbA_{1c}$ levels on adverse pregnancy outcomes during pregnancy in patients with type 1 diabetes. *J Clin Endocrinol Metab* 2022; **107:** e1117–25.

57 National Institute for Health and Care Excellence (NICE). Continuous glucose monitoring: diabetes in pregnancy: management from preconception to the postnatal period. Dec 16, 2020. https://www.ncbi.nlm.nih.gov/books/NBK555331/ (accessed Oct 24, 2025).

58 Tundidor D, Meek CL, Yamamoto J, et al, and the CONCEPTT Collaborative Group. Continuous glucose monitoring time-in-range and $HbA_{1c}$ targets in pregnant women with type 1 diabetes. *Diabetes Technol Ther* 2021; **23:** 710–14.

59 Phillip M, Nimri R, Bergenstal RM, et al. Consensus recommendations for the use of automated insulin delivery (AID) technologies in clinical practice. *Endocr Rev* 2023; **44:** 254–80.

60 Leelarathna L, Choudhary P, Wilmot EG, et al. Hybrid closed-loop therapy: where are we in 2021? *Diabetes Obes Metab* 2021; **23:** 655–60.

61 Kluemper JR, Smith A, Wobeter B. Diabetes: the role of continuous glucose monitoring. *Drugs Context* 2022; **11:** 2021–9-13.

62 Boughton CK, Hovorka R. New closed-loop insulin systems. *Diabetologia* 2021; **64:** 1007–15.

63 Murphy HR, Roland JM, Skinner TC, et al. Effectiveness of a regional prepregnancy care program in women with type 1 and type 2 diabetes: benefits beyond glycemic control. *Diabetes Care* 2010; **33:** 2514–20.

64 Tripathi A, Rankin J, Aarvold J, Chandler C, Bell R. Preconception counseling in women with diabetes: a population-based study in the north of England. *Diabetes Care* 2010; **33:** 586–88.

65 Rizos EC, Markozannes G, Charitakis N, et al. Continuous glucose monitoring in type 1 diabetes, type 2 diabetes, and diabetes during pregnancy: a systematic review with meta-analysis of randomized controlled trials. *Diabetes Technol Ther* 2025; **27:** 537–52.

66 Murphy HR, Feig DS, Sanchez JJ, de Portu S, Sale A, and the CONCEPTT Collaborative Group. Modelling potential cost savings from use of real-time continuous glucose monitoring in pregnant women with type 1 diabetes. *Diabet Med* 2019; **36:** 1652–58.

67 Diab YH, Saade G, Kawakita T. Continuous glucose monitoring *vs.* self-monitoring in pregnant individuals with type 1 diabetes: an economic analysis. *Am J Obstet Gynecol MFM* 2024; **6:** 101413.

68 Ahmed RJ, Gafni A, Hutton EK, et al, and the CONCEPTT Collaborative Group. The cost implications of continuous glucose monitoring in pregnant women with type 1 diabetes in 3 Canadian provinces: a posthoc cost analysis of the CONCEPTT trial. *CMAJ Open* 2021; **9:** e627–34.

69 Sekhon J, Graham D, Mehrotra C, Li I. Continuous glucose monitoring: a cost-effective tool to reduce pre-term birth rates in women with type one diabetes. *Aust N Z J Obstet Gynaecol* 2023; **63:** 146–53.

70 Lee TTM, Collett C, Bergford S, et al, and the AiDAPT Collaborative Group. Automated insulin delivery in women with pregnancy complicated by type 1 diabetes. *N Engl J Med* 2023; **389:** 1566–78.

71 Benhalima K, Beunen K, Van Wilder N, et al. Comparing advanced hybrid closed loop therapy and standard insulin therapy in pregnant women with type 1 diabetes (CRISTAL): a parallel-group, open-label, randomised controlled trial. *Lancet Diabetes Endocrinol* 2024; **12:** 390–403.

72 Donovan LE, Lemieux P, Dunlop AD, et al, and the CIRCUIT Collaborative Group. Closed-loop insulin delivery in type 1 diabetes in pregnancy: the CIRCUIT randomized clinical trial. *JAMA* 2025; published online Oct 24. https://doi.org/10.1001/jama.2025.19578.

73 Stewart ZA, Yamamoto JM, Wilinska ME, et al. Adaptability of closed loop during labor, delivery, and postpartum: a secondary analysis of data from two randomized crossover trials in type 1 diabetes pregnancy. *Diabetes Technol Ther* 2018; **20:** 501–05.

74 Beunen K, Gillard P, Van Wilder N, et al. Advanced hybrid closed-loop therapy compared with standard insulin therapy intrapartum and early postpartum in women with type 1 diabetes: a secondary observational analysis from the CRISTAL randomized controlled trial. *Diabetes Care* 2024; **47:** 2002–11.

75 Polsky S, Buschur E, Dungan K, et al. Randomized trial of assisted hybrid closed-loop therapy versus sensor-augmented pump therapy in pregnancy. *Diabetes Technol Ther* 2024; **26:** 547–55.

76 Donovan LE, Feig DS, Lemieux P, et al. A randomized trial of closed-loop insulin delivery postpartum in type 1 diabetes. *Diabetes Care* 2023; **46:** 2258–66.

78 Donovan LE, Lemieux P, Dunlop A, et al. 2084-LB: a randomized multicenter trial of hybrid closed-loop insulin therapy with Control-IQ technology in type 1 diabetes in pregnancy. *Diabetes* 2025; **74** (suppl 1)**:** 2084-LB.

77 Lee TTM, Collett C, Bergford S, et al, and the AiDAPT Collaborative Group. Automated insulin delivery during the first 6 months postpartum (AiDAPT): a prespecified extension study. *Lancet Diabetes Endocrinol* 2025; **13:** 210–20.

79 Benhalima K, Polsky S. Automated insulin delivery in pregnancies complicated by tpe 1 diabetes. *J Diabetes Sci Technol* 2025; published online March 12. https://doi.org/10.1177/19322968251323614.

80 Okigbo CC, McLaughlin C, Kirkman MS. 1053-P: prevalence, predictors, and consequences of unplanned pregnancy in women with preexisting diabetes. *Diabetes* 2022; **71** (suppl 1)**:** 1053-P.

81 Jones LV, Ray A, Moy FM, Buckley BS. Techniques of monitoring blood glucose during pregnancy for women with pre-existing diabetes. *Cochrane Database Syst Rev* 2019; **5:** CD009613.

82 Chang VYX, Tan YL, Ang WHD, Lau Y. Effects of continuous glucose monitoring on maternal and neonatal outcomes in perinatal women with diabetes: a systematic review and meta-analysis of randomized controlled trials. *Diabetes Res Clin Pract* 2022; **184:** 109192.

83 Feig DS, Berger H, Donovan L, et al, and the Diabetes Canada Clinical Practice Guidelines Expert Committee. Diabetes and pregnancy. *Can J Diabetes* 2018; **42** (suppl 1)**:** s255–82.

84 Rys PM, Ludwig-Slomczynska AH, Cyganek K, Malecki MT. Continuous subcutaneous insulin infusion vs multiple daily injections in pregnant women with type 1 diabetes mellitus: a systematic review and meta-analysis of randomised controlled trials and observational studies. *Eur J Endocrinol* 2018; **178:** 545–63.

85 Żurawska-Kliś M, Kosiński M, Kuchnicka A, et al. Continuous subcutaneous insulin infusion does not correspond with pregnancy outcomes despite better glycemic control as compared to multiple daily injections in type 1 diabetes—significance of pregnancy planning and prepregnancy $HbA_{1c}$. *Diabetes Res Clin Pract* 2021; **172:** 108628.

86 Levy CJ, Foster NC, DuBose SN, et al. Changes in device uptake and glycemic control among pregnant women with type 1 diabetes: data from the T1D exchange. *J Diabetes Sci Technol* 2020; **15:** 1297–302.

87 Farrar D, Tuffnell DJ, West J. Continuous subcutaneous insulin infusion versus multiple daily injections of insulin for pregnant women with diabetes. *Cochrane Database Syst Rev* 2007; **3:** CD005542.

88 Kallas-Koeman MM, Kong JM, Klinke JA, et al. Insulin pump use in pregnancy is associated with lower $HbA_{1c}$ without increasing the rate of severe hypoglycaemia or diabetic ketoacidosis in women with type 1 diabetes. *Diabetologia* 2014; **57:** 681–89.

89 Thorius IH, Husemoen LLN, Nordsborg RB, et al. Fetal overgrowth and preterm delivery in women with type 1 diabetes using insulin pumps or multiple daily injections: a post hoc analysis of the EVOLVE study cohort. *Diabetes Care* 2024; **47:** 384–92.

90 Thorius IH, Husemoen LLN, Nordsborg RB, et al. Congenital malformations among offspring of women with type 1 diabetes who use insulin pumps: a prospective cohort study. *Diabetologia* 2023; **66:** 826–36.

91 Hauffe F, Schaefer-Graf UM, Fauzan R, et al. Higher rates of large-for-gestational-age newborns mediated by excess maternal weight gain in pregnancies with type 1 diabetes and use of continuous subcutaneous insulin infusion vs multiple dose insulin injection. *Diabet Med* 2019; **36:** 158–66.

92 Wang Z, James-Todd TM, Isganaitis E, et al. Associations of insulin pump and continuous glucose monitoring use with pregnancy-related outcomes in women with type 1 diabetes. *Diabetes Res Clin Pract* 2022; **187:** 109854.

93 Fisher SA, Huang J, DuBord AY, et al. Continuous subcutaneous infusion versus multiple daily injections of insulin for pregestational diabetes in pregnancy: a systematic review and meta-analysis. *J Diabetes Sci Technol* 2023; **17:** 1337–63.

94 Feig DS, Corcoy R, Donovan LE, et al, and the CONCEPTT Collaborative Group. Pumps or multiple daily injections in pregnancy involving type 1 diabetes: a prespecified analysis of the CONCEPTT randomized trial. *Diabetes Care* 2018; **41:** 2471–79.

95 Mathiesen JM, Secher AL, Ringholm L, et al. Changes in basal rates and bolus calculator settings in insulin pumps during pregnancy in women with type 1 diabetes. *J Matern Fetal Neonatal Med* 2014; **27:** 724–28.

96 O'Malley G, Ozaslan B, Levy CJ, et al. Longitudinal observation of insulin use and glucose sensor metrics in pregnant women with type 1 diabetes using continuous glucose monitors and insulin pumps: the LOIS-P study. *Diabetes Technol Ther* 2021; **23:** 807–17.

97 Gómez AM, Marín Carrillo LF, Arévalo Correa CM, et al. Maternal–fetal outcomes in 34 pregnant women with type 1 diabetes in sensor-augmented insulin pump therapy. *Diabetes Technol Ther* 2017; **19:** 417–22.

98 Benhalima K, van Nes F, Laenen A, Gillard P, Mathieu C. Risk for ketonaemia in type 1 diabetes pregnancies with sensor-augmented pump therapy with predictive low glucose suspend compared with low glucose suspend: a crossover RCT. *Diabetologia* 2021; **64:** 2725–30.

99 Roberto DA, Elena C, Anna C, et al. Sensor augmented pump therapy with predictive suspension function for low glucose levels reduces time in hypoglycaemia in pregnant women with type 1 diabetes. *Acta Diabetol* 2023; **60:** 1283–85.

100 Lee TTM, Collett C, Man MS, et al, and the AiDAPT Collaborative Group. AiDAPT: automated insulin delivery amongst pregnant women with type 1 diabetes: a multicentre randomized controlled trial—study protocol. *BMC Pregnancy Childbirth* 2022; **22:** 282.

101 Lee TTM, Collett C, Bergford S, et al. Automated closed-loop insulin delivery for the management of type 1 diabetes during pregnancy: the AiDAPT RCT. *Efficacy and Mechanism Evaluation* 2024; **11:** 1–80.

102 Lawton J, Kimbell B, Closs M, et al. Listening to women: experiences of using closed-loop in type 1 diabetes pregnancy. *Diabetes Technol Ther* 2023; **25:** 845–55.

103 Beunen K, Van Wilder N, Ballaux D, et al. Closed-loop insulin delivery in pregnant women with type 1 diabetes (CRISTAL): a multicentre randomized controlled trial—study protocol. *BMC Pregnancy Childbirth* 2023; **23:** 180.

104 Quirós C, Herrera Arranz MT, Amigó J, et al. Real-world evidence of off-label use of commercially automated insulin delivery systems compared to multiple daily insulin injections in pregnancies complicated by type 1 diabetes. *Diabetes Technol Ther* 2024; **26:** 596–606.

105 Azahaf S, Beunen K, Van Wilder N, et al. Cost-effectiveness of advanced hybrid closed loop therapy compared to standard insulin therapy for type 1 diabetes in pregnancy: an economic evaluation of the CRISTAL trial. *eClinicalMedicine* 2025; **81:** 103106.

106 Buschur EO, Reedy J, Berget C, et al. Mixed methods randomized controlled trial comparing quality of life for pregnant women with type 1 diabetes using hybrid closed-loop to sensor-augmented pump therapy. *Endocr Pract* 2025; **31:** 494–502.

107 Szmuilowicz ED, Levy CJ, Buschur EO, Polsky S. Expert guidance on off-label use of hybrid closed-loop therapy in pregnancies complicated by diabetes. *Diabetes Technol Ther* 2023; **25:** 363–73.

108 Nandam N, Thung S, Venkatesh KK, et al. Tandem T:Slim X2 insulin pump use in clinical practice among pregnant individuals with type 1 diabetes: a retrospective observational cohort study. *Cureus* 2024; **16:** e52369.

109 Brigham TL, Klein MP, Snell-Bergeon JK, Polsky S. Case series of a hybrid closed loop therapy system used in pregnancy. *Acta Diabetol* 2025; **62:** 1439–49.

110 Klein MP, Brigham TL, Snell-Bergeon JK, Polsky S. Case series of use of an automated insulin delivery system during hospital admission for labor and delivery. *J Diabetes Sci Technol* 2024; **18:** 1263–64.

111 Chillakanti M, Young E, Hopcroft A, Bellini N, Smith J, Isaacs D. Use of automated insulin delivery in pregnancies complicated by type 1 diabetes. *touchREV Endocrinol* 2024; **20:** 110–18.

112 Sobhani NC, Han CS, Sarker MR, Shah S, Ramos GA. Use of a Commercially available automated insulin delivery system for the management of type 1 diabetes in pregnancy. *J Diabetes Sci Technol* 2024; **18:** 1509–10.

113 Tahir S, Naeem S, Nayyab I, et al. Hybrid closed loop insulin therapy versus standard therapy in pregnant women with type 1 diabetes: a systematic review and meta-analysis of randomized controlled trials. *Eur J Obstet Gynecol Reprod Biol* 2025; **310:** 113969.

114 Stamati A, Christoforidis A. Automated insulin delivery in pregnant women with type 1 diabetes mellitus: a systematic review and meta-analysis. *Acta Diabetol* 2025; **62:** 441–52.

115 Yang Q, Hao J, Cui H, Yang Q, Sun F, Zeng B. Automated insulin delivery in pregnant women with type 1 diabetes: a systematic review and meta-analysis. *Acta Diabetol* 2025; **62:** 1325–35.

116 Munda A, Kovacic C, Pongrac Barlovic D. Carbohydrate intake and closed-loop insulin delivery system during two subsequent pregnancies in type 1 diabetes. *Metabolites* 2022; **12:** 1137.

117 Wang XS, Dunlop AD, McKeen JA, Feig DS, Donovan LE. Real-world use of Control-IQ™ technology automated insulin delivery in pregnancy: a case series with qualitative interviews. *Diabet Med* 2023; **40:** e15086.

118 Albert L, Romero A, Capel I, et al. Off-label use of an automated insulin delivery system in pregnant women with type 1 diabetes. *Diabetes Res Clin Pract* 2023; **202:** 110800.

119 Pham AQ, Lingvay I, Ahmadi N, Santiago-Munoz PC, Abreu M. Use of commercially available automated insulin delivery systems in pregnant people with type 1 diabetes. *Diabetes Res Clin Pract* 2025; **228:** 112454.

120 Sobhani NC. Impact of AID on glycemic profile and maternal/neonatal outcomes in pregnancy: a review of the evidence from observational studies. *J Diabetes Sci Technol* 2025; published online March 22. https://doi.org/10.1177/19322968251327603.

121 Quirós C, Wägner AM, Azriel S, et al. A real-world study comparing advanced hybrid closed-loop systems during pregnancy in women with type 1 diabetes. *Diabetes Technol Ther* 2025; published online Sept 26. https://doi.org/10.1177/15209156251379488.

122 Ozaslan B, Deshpande S, Doyle FJ 3rd, Dassau E. Zone-MPC automated insulin delivery algorithm tuned for pregnancy complicated by type 1 diabetes. *Front Endocrinol* 2022; **12:** 768639.

123 Levy CJ, Kudva YC, Ozaslan B, et al, and the LOIS-P Diabetes and Pregnancy Consortium. At-home use of a pregnancy-specific zone-MPC closed-loop system for pregnancies complicated by type 1 diabetes: a single-arm, observational multicenter study. *Diabetes Care* 2023; **46:** 1425–31.

124 Ozaslan B, Levy CJ, Kudva YC, et al. Feasibility of closed-loop insulin delivery with a pregnancy-specific zone model predictive control algorithm. *Diabetes Technol Ther* 2022; **24:** 471–80.

125 Deshpande S, Pinsker JE, Zavitsanou S, et al. Design and clinical evaluation of the interoperable artificial pancreas system (iAPS) smartphone app: interoperable components with modular design for progressive artificial pancreas research and development. *Diabetes Technol Ther* 2019; **21:** 35–43.

126 Bukhari K, Malek R. Open-source automated insulin delivery systems for the management of type 1 diabetes during pregnancy. *BMJ Case Rep* 2021; **14:** e243522.

127 Schütz AK, Schütz-Fuhrmann I, Stadler M, Staudinger H, Mader JK. Management of type 1 diabetes mellitus using open-source automated insulin delivery during pregnancy: a case series. *Diabetes Technol Ther* 2022; **24:** 227–30.

128 Sobhani NC, Killion M, Patzek S. Use of open-source automated insulin delivery systems in pregnancies with type 1 diabetes. *J Diabetes Sci Technol* 2023; **17:** 1126–28.

129 Lemieux P, Yamamoto JM, Donovan LE. Do-it-yourself artificial pancreas system use in pregnant women with type 1 diabetes in a real-world setting: 2 case reports. *Can J Diabetes* 2021; **45:** 804–08.

130 Asgharzadeh A, Patel M, Connock M, et al. Hybrid closed-loop systems for managing blood glucose levels in type 1 diabetes: a systematic review and economic modelling. *Health Technol Assess* 2024; **28:** 1–190.

131 Teixeira T, Godoi A, Romeiro P, et al. Efficacy of automated insulin delivery in pregnant women with type 1 diabetes: a meta-analysis and trial sequential analysis of randomized controlled trials. *Acta Diabetol* 2024; **61:** 831–40.

132 Lei M, Chen D, Ling P, et al. Effect of artificial pancreas system use on glycaemic control among pregnant women with type 1 diabetes mellitus: a meta-analysis of randomized controlled trials. *Diabetes Obes Metab* 2024; **26:** 673–81.

133 Murphy HR. Continuous glucose monitoring targets in type 1 diabetes pregnancy: every 5% time in range matters. *Diabetologia* 2019; **62:** 1123–28.

134 Rankin D, Hart RI, Kimbell B, et al. Rollout of closed-loop technology to pregnant women with type 1 diabetes: healthcare professionals' views about potential challenges and solutions. *Diabetes Technol Ther* 2023; **25:** 260–69.

135 Lawton J, Rankin D, Hartnell S, et al, and the AiDAPT Collaborative Group. Healthcare professionals' views about how pregnant women can benefit from using a closed-loop system: qualitative study. *Diabet Med* 2023; **40:** e15072.

136 Kristensen K, Ögge LE, Sengpiel V, et al. Continuous glucose monitoring in pregnant women with type 1 diabetes: an observational cohort study of 186 pregnancies. *Diabetologia* 2019; **62:** 1143–53.

137 Sobhani NC, Goemans S, Nguyen A, et al. Continuous glucose monitoring in pregnancies with type 1 diabetes: small increases in time-in-range improve maternal and perinatal outcomes. *Am J Obstet Gynecol* 2024; **231:** 467.

138 Scott EM, Murphy HR, Kristensen KH, et al. Continuous glucose monitoring metrics and birth weight: informing management of type 1 diabetes throughout pregnancy. *Diabetes Care* 2022; **45:** 1724–34.

139 Sibiak R, Gutaj P, Mrzewka-Rogacz B, Mantaj U, Wender-Ozegowska E. Novel continuous glucose monitoring metrics and large-for-gestational-age risk: an exploratory retrospective cohort study in pregnancies with type 1 diabetes. *Diabetes Technol Ther* 2022; **24:** 42–53.

140 Søholm JC, Nørgaard SK, Nørgaard K, et al. Mean glucose and gestational weight gain as predictors of large-for-gestational-age infants in pregnant women with type 1 diabetes using continuous glucose monitoring. *Diabetes Technol Ther* 2024; **26:** 536–46.

141 Law GR, Ellison GTH, Secher AL, et al. Analysis of continuous glucose monitoring in pregnant women with diabetes: distinct temporal patterns of glucose associated with large-for-gestational-age infants. *Diabetes Care* 2015; **38:** 1319–25.

142 Sibiak R, Mantaj U, Gutaj P, Law GR, Wender-Ozegowska E. Functional analysis of daily glycemic profiles and excessive fetal growth in pregnant patients with well-controlled type 1 diabetes: retrospective cohort. *Diabetes Res Clin Pract* 2024; **207:** 111088.

143 Scott EM, Feig DS, Murphy HR, et al, and the CONCEPTT Collaborative Group. Continuous glucose monitoring in pregnancy: importance of analyzing temporal profiles to understand clinical outcomes. *Diabetes Care* 2020; **43:** 1178–84.

144 Ling P, Yang D, Wang C, et al. Basal hyperglycemia contributes more than 50% to time in range in pregnant women with type 1 diabetes. *J Clin Endocrinol Metab* 2024; **109:** 3264–71.

145 Battarbee AN, Sauer SM, Sanusi A, Fulcher I. Discrete glucose profiles identified using continuous glucose monitoring data and their association with adverse pregnancy outcomes. *Am J Obstet Gynecol* 2024; **231:** 122.

146 Buschur EO, Campbell K, Pyle L, et al. Exploratory analysis of glycemic control and variability over gestation among pregnant women with type 1 diabetes. *Diabetes Technol Ther* 2021; **23:** 768–72.

147 Shah VN, Snell-Bergeon JK, Demmitt JK, et al. Relationship between time-in-range, $HbA_{1c}$, and the glucose management indicator in pregnancies complicated by type 1 diabetes. *Diabetes Technol Ther* 2021; **23:** 783–90.

148 Meek CL, Tundidor D, Feig DS, et al, and the CONCEPTT Collaborative Group. Novel biochemical markers of glycemia to predict pregnancy outcomes in women with type 1 diabetes. *Diabetes Care* 2021; **44:** 681–89.

149 Sanusi AA, Xue Y, McIlwraith C, et al. Association of continuous glucose monitoring metrics with pregnancy outcomes in patients with preexisting diabetes. *Diabetes Care* 2024; **47:** 89–96.

150 Tiselko AV, Kapustin RV, Milyutina YP, Borovik NV, Abashova EI, Yarmolinskaya MI. Glucose variability as the risk factor of preeclampsia in pregnant patients with type 1 diabetes mellitus. *J Matern Fetal Neonatal Med* 2022; **35:** 9639–46.

151 Gómez Medina AM, Soto Chávez MJ, Henao Carrillo DC, et al. Determination of time in range associated with $HbA_{1c} \leq 6 \cdot 5\%$ in Latin American pregnant women diagnosed with type 1 diabetes mellitus using an automated insulin delivery system. *Diabetes Res Clin Pract* 2023; **200:** 110713.

152 Gómez Medina AM, Henao Carrillo DC, Serrano Macías MN, et al. Time in range and mean glucose cut-off points for reduction of fetal outcomes in pregnant women with type 1 diabetes using automated insulin delivery systems. *Diabetes Res Clin Pract* 2024; **217:** 111902.

153 Rodbard D. Continuous glucose monitoring metrics (mean Glucose, time above range and time in range) are superior to glycated haemoglobin for assessment of therapeutic efficacy. *Diabetes Obes Metab* 2023; **25:** 596–601.

154 Rademaker D, van der Wel AWT, van Eekelen R, et al, and the GlucoMOMS studygroup. Continuous glucose monitoring metrics and pregnancy outcomes in insulin-treated diabetes: a post-hoc analysis of the GlucoMOMS trial. *Diabetes Obes Metab* 2023; **25:** 3798–806.

155 Dude A, Niznik CM, Szmuilowicz ED, Peaceman AM, Yee LM. Management of diabetes in the intrapartum and postpartum patient. *Am J Perinatol* 2018; **35:** 1119–26.

156 Dashora U, Levy N, Dhatariya K, et al, and the Joint British Diabetes Societies In Patient group. 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* 2022; **39:** e14744.

157 Joshi T, Oldmeadow C, Attia J, Wynne K. The duration of intrapartum maternal hyperglycaemia predicts neonatal hypoglycaemia in women with pre-existing diabetes. *Diabet Med* 2017; **34:** 725–31.

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

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

160 Yamamoto JM, Kallas-Koeman MM, Butalia S, Lodha AK, Donovan LE. Large-for-gestational-age (LGA) neonate predicts a $2 \cdot 5$-fold increased odds of neonatal hypoglycaemia in women with type 1 diabetes. *Diabetes Metab Res Rev* 2017; **33:** e2824.

161 Yamamoto JM, Benham J, Mohammad K, Donovan LE, Wood S. Intrapartum glycaemic control and neonatal hypoglycaemia in pregnancies complicated by diabetes: a systematic review. *Diabet Med* 2018; **35:** 173–83.

162 Drever E, Tomlinson G, Bai AD, Feig DS. Insulin pump use compared with intravenous insulin during labour and delivery: the INSPIRED observational cohort study. *Diabet Med* 2016; **33:** 1253–59.

163 Wilkie GL, Delpapa E, Leftwich HK. Intrapartum continuous subcutaneous insulin infusion vs intravenous insulin infusion among pregnant individuals with type 1 diabetes mellitus: a randomized controlled trial. *Am J Obstet Gynecol* 2023; **229:** 680.

164 Wilkie G, Orr L, Leung K, Leftwich H. Comparison of intrapartum glycemic management strategies in pregnant women with type 1 diabetes mellitus. *J Matern Fetal Neonatal Med* 2022; **35:** 8756–60.

165 Padmanabhan S, Lee VW, Mclean M, et al. The association of falling insulin requirements with maternal biomarkers and placental dysfunction: a prospective study of women with preexisting diabetes in pregnancy. *Diabetes Care* 2017; **40:** 1323–30.

166 Achong N, Duncan EL, McIntyre HD, Callaway L. Peripartum management of glycemia in women with type 1 diabetes. *Diabetes Care* 2014; **37:** 364–71.

167 Ringholm L, Søholm JC, Pedersen BW, Clausen TD, Damm P, Mathiesen ER. Glucose control during labour and delivery in type 1 diabetes—an update on current evidence. *Curr Diab Rep* 2025; **25:** 7.

168 GO MOMs Study Group. Design, rationale and protocol for Glycemic Observation and Metabolic Outcomes in Mothers and Offspring (GO MOMs): an observational cohort study. *BMJ Open* 2024; **14:** e084216.

169 Riviello C, Mello G, Jovanovic LG. Breastfeeding and the basal insulin requirement in type 1 diabetic women. *Endocr Pract* 2009; **15:** 187–93.

170 Ringholm L, Roskjær AB, Engberg S, et al. Breastfeeding at night is rarely followed by hypoglycaemia in women with type 1 diabetes using carbohydrate counting and flexible insulin therapy. *Diabetologia* 2019; **62:** 387–98.

171 Nørgaard SK, Nørgaard K, Roskjær AB, Mathiesen ER, Ringholm L. Insulin pump settings during breastfeeding in women with type 1 diabetes. *Diabetes Technol Ther* 2020; **22:** 314–20.

172 Ringholm L, Stougaard EB, Nørgaard SK, Damm P, Mathiesen ER. diabetes management during breastfeeding in women with type 1 diabetes. *Curr Diab Rep* 2020; **20:** 34.

173 Achong N, McIntyre HD, Callaway L, Duncan EL. Glycaemic behaviour during breastfeeding in women with type 1 diabetes. *Diabet Med* 2016; **33:** 947–55.

174 Mackin ST, Nelson SM, Kerssens JJ, et al, and the SDRN Epidemiology Group. Diabetes and pregnancy: national trends over a 15 year period. *Diabetologia* 2018; **61:** 1081–88.

175 Wahabi HA, Alzeidan RA, Bawazeer GA, Alansari LA, Esmaeil SA. Preconception care for diabetic women for improving maternal and fetal outcomes: a systematic review and meta-analysis. *BMC Pregnancy Childbirth* 2010; **10:** 63.

176 Ajjan RA, Battelino T, Cos X, et al. Continuous glucose monitoring for the routine care of type 2 diabetes mellitus. *Nat Rev Endocrinol* 2024; **20:** 426–40.

177 Bailey KJ, Little JP, Jung ME. Self-monitoring using continuous glucose monitors with real-time feedback improves exercise adherence in individuals with impaired blood glucose: a pilot study. *Diabetes Technol Ther* 2016; **18:** 185–93.

178 Secher AL, Ringholm L, Andersen HU, Damm P, Mathiesen ER. The effect of real-time continuous glucose monitoring in pregnant women with diabetes: a randomized controlled trial. *Diabetes Care* 2013; **36:** 1877–83.

179 Murphy HR, Rayman G, Lewis K, et al. Effectiveness of continuous glucose monitoring in pregnant women with diabetes: randomised clinical trial. *BMJ* 2008; **337:** a1680.

180 Voormolen DN, DeVries JH, Sanson RME, et al. Continuous glucose monitoring during diabetic pregnancy (GlucoMOMS): a multicentre randomized controlled trial. *Diabetes Obes Metab* 2018; **20:** 1894–902.

181 Padgett CE, Ye Y, Champion ML, et al. Continuous glucose monitoring for management of type 2 diabetes and perinatal outcomes. *Obstet Gynecol* 2024; **144:** 677–83.

182 McLean A, Sinha A, Barr E, Maple-Brown L. Feasibility and acceptability of intermittently scanned continuous glucose monitoring for women with type 2 diabetes in pregnancy. *J Diabetes Sci Technol* 2022; **17:** 256–58.

183 McLean A, Barr E, Tabuai G, Murphy HR, Maple-Brown L. Continuous glucose monitoring metrics in high-risk pregnant women with type 2 diabetes. *Diabetes Technol Ther* 2023; **25:** 836–44.

184 Battelino T, Lalic N, Hussain S, et al. The use of continuous glucose monitoring in people living with obesity, intermediate hyperglycemia or type 2 diabetes. *Diabetes Res Clin Pract* 2025; **223:** 112111.

185 Gunabalasingam S, Kyrka A, Hopkins L, et al. Interventions in women with type 2 diabetes mellitus in the pre-pregnancy, pregnancy and postpartum periods to optimise care and health outcomes: a systematic review. *Diabet Med* 2025; **42:** e15474.

186 Bellido V, Aguilera E, Cardona-Hernandez R, et al. Expert recommendations for using time-in-range and other continuous glucose monitoring metrics to achieve patient-centered glycemic control in people with diabetes. *J Diabetes Sci Technol* 2022; **17:** 1326–36.

187 WHO. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy: a World Health Organization Guideline. *Diabetes Res Clin Pract* 2014; **103:** 341–63.

188 Wang H, Li N, Chivese T, et al, and the IDF Diabetes Atlas Committee Hyperglycaemia in Pregnancy Special Interest Group. IDF diabetes atlas: estimation of global and regional gestational diabetes mellitus prevalence for 2021 by International Association of Diabetes in Pregnancy Study Group's criteria. *Diabetes Res Clin Pract* 2022; **183:** 109050.

189 Sweeting A, Hannah W, Backman H, et al. Epidemiology and management of gestational diabetes. *Lancet* 2024; **404:** 175–92.

190 Buchanan TA, Xiang AH, Page KA, Watanabe RM. What is gestational diabetes—really? *Diabetes* 2025; **74:** 1037–46.

191 Pillay J, Donovan L, Guitard S, et al. Screening for gestational diabetes: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA* 2021; **326:** 539–62.

192 Simmons D, Immanuel J, Hague WM, et al, and the TOBOGM Research Group. Treatment of gestational diabetes mellitus diagnosed early in pregnancy. *N Engl J Med* 2023; **388:** 2132–44.

193 Crowther CA, Samuel D, Hughes R, et al, and the TARGET Study Group. Tighter or less tight glycaemic targets for women with gestational diabetes mellitus for reducing maternal and perinatal morbidity: a stepped-wedge, cluster-randomised trial. *PLoS Med* 2022; **19:** e1004087.

194 Hofer OJ, Martis R, Alsweiler J, Crowther CA. Different intensities of glycaemic control for women with gestational diabetes mellitus. *Cochrane Database Syst Rev* 2023; **10:** CD011624.

195 Prutsky GJ, Domecq JP, Wang Z, et al. Glucose targets in pregnant women with diabetes: a systematic review and meta-analysis. *J Clin Endocrinol Metab* 2013; **98:** 4319–24.

196 Lowe LP, Metzger BE, Dyer AR, et al, and the HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcome (HAPO) study: associations of maternal $A_{1c}$ and glucose with pregnancy outcomes. *Diabetes Care* 2012; **35:** 574–80.

197 Liu X, Wu N, Al-Mureish A. A review on research progress in the application of glycosylated hemoglobin and glycated albumin in the screening and monitoring of gestational diabetes. *Int J Gen Med* 2021; **14:** 1155–65.

198 Sweeting AN, Ross GP, Hyett J, et al. Baseline $HbA_{1c}$ to identify high-risk gestational diabetes: utility in early vs standard gestational diabetes. *J Clin Endocrinol Metab* 2017; **102:** 150–56.

199 Immanuel J, Simmons D, Desoye G, et al. Performance of early pregnancy $HbA_{1c}$ for predicting gestational diabetes mellitus and adverse pregnancy outcomes in obese European women. *Diabetes Res Clin Pract* 2020; **168:** 108378.

200 Raman P, Shepherd E, Dowswell T, Middleton P, Crowther CA. Different methods and settings for glucose monitoring for gestational diabetes during pregnancy. *Cochrane Database Syst Rev* 2017; **10:** CD011069.

201 García-Moreno RM, Benítez-Valderrama P, Barquiel B, et al. Efficacy of continuous glucose monitoring on maternal and neonatal outcomes in gestational diabetes mellitus: a systematic review and meta-analysis of randomized clinical trials. *Diabet Med* 2022; **39:** e14703.

202 Burk J, Ross GP, Hernandez TL, Colagiuri S, Sweeting A. Evidence for improved glucose metrics and perinatal outcomes with continuous glucose monitoring compared to self-monitoring in diabetes during pregnancy. *Am J Obstet Gynecol* 2025; **233:** 162–75.

203 Linder T, Dressler-Steinbach I, Wegener S, et al, and the GRACE study collaborative group. Glycaemic control and pregnancy outcomes with real-time continuous glucose monitoring in gestational diabetes (GRACE): an open-label, multicentre, multinational, randomised controlled trial. *Lancet Diabetes Endocrinol* 2025; published online Nov 24. https://doi.org/10.1016/S2213-8587(25)00288-8.

204 Lai M, Weng J, Yang J, et al. Effect of continuous glucose monitoring compared with self-monitoring of blood glucose in gestational diabetes patients with $HbA_{1c}$ <6%: a randomized controlled trial. *Front Endocrinol* 2023; **14:** 1174239.

205 Shen SY, Žurauskienė J, Wei DM, et al. Identification of maternal continuous glucose monitoring metrics related to newborn birth weight in pregnant women with gestational diabetes. *Endocrine* 2021; **74:** 290–99.

206 Liang X, Fu Y, Lu S, et al. Continuous glucose monitoring-derived glycemic metrics and adverse pregnancy outcomes among women with gestational diabetes: a prospective cohort study. *Lancet Reg Health West Pac* 2023; **39:** 100823.

207 Yu F, Lv L, Liang Z, et al. Continuous glucose monitoring effects on maternal glycemic control and pregnancy outcomes in patients with gestational diabetes mellitus: a prospective cohort study. *J Clin Endocrinol Metab* 2014; **99:** 4674–82.

208 Wei Q, Sun Z, Yang Y, Yu H, Ding H, Wang S. Effect of a CGMS and SMBG on maternal and neonatal outcomes in gestational diabetes mellitus: a randomized controlled trial. *Sci Rep* 2016; **6:** 19920.

209 Paramasivam SS, Chinna K, Singh AKK, et al. Continuous glucose monitoring results in lower $HbA_{1c}$ in Malaysian women with insulin-treated gestational diabetes: a randomized controlled trial. *Diabet Med* 2018; **35:** 1118–29.

210 Alfadhli E, Osman E, Basri T. Use of a real time continuous glucose monitoring system as an educational tool for patients with gestational diabetes. *Diabetol Metab Syndr* 2016; **8:** 48.

211 Law GR, Alnaji A, Alrefaii L, et al. Suboptimal nocturnal glucose control is associated with large for gestational age in treated gestational diabetes mellitus. *Diabetes Care* 2019; **42:** 810–15.

212 Kusinski LC, Atta N, Jones DL, et al. Continuous glucose monitoring metrics and pregnancy outcomes in women with gestational diabetes mellitus: a secondary analysis of the DiGest trial. *Diabetes Care* 2025; published online Aug 19. https://doi.org/10.2337/dc25–0452.

213 Amylidi-Mohr S, Zennaro G, Schneider S, Raio L, Mosimann B, Surbek D. Continuous glucose monitoring in the management of gestational diabetes in Switzerland (DipGluMo): an open-label, single-centre, randomised, controlled trial. *Lancet Diabetes Endocrinol* 2025; **13:** 591–99.

214 Simmons D, Chai TY. Continuous glucose monitoring in gestational diabetes. *Lancet Diabetes Endocrinol* 2025; **13:** 541–42.

215 Valent AM, Rickert M, Pagan CH, Ward L, Dunn E, Rincon M. Real-time continuous glucose monitoring in pregnancies with gestational diabetes mellitus: a randomized controlled trial. *Diabetes Care* 2025; **48:** 1581–88.

216 Durnwald C, Beck RW, Li Z, et al. Continuous glucose monitoring-derived differences in pregnancies with and without adverse perinatal outcomes. *Obstet Gynecol* 2024; **144:** 684–96.

217 Carlson AL, Beck RW, Li Z, et al. Continuous glucose monitoring-measured glucose levels during oral glucose tolerance testing in pregnancy. *Diabetes Technol Ther* 2025; **27:** 439–48.

218 Durnwald C, Beck RW, Li Z, et al. Continuous glucose monitoring profiles in pregnancies with and without gestational diabetes mellitus. *Diabetes Care* 2024; **47:** 1333–41.

219 Li Z, Beck R, Durnwald C, et al. Continuous glucose monitoring prediction of gestational diabetes mellitus and perinatal complications. *Diabetes Technol Ther* 2024; **26:** 787–96.

220 ACOG practice bulletin no 190: gestational diabetes mellitus. *Obstet Gynecol* 2018; **131:** e49–64.