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Special Article

Blood Glucose Monitoring in Adults and Children with Diabetes: Update 2021

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Introduction

The *Diabetes Canada Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* (CPG) were last published in 2018 (1). Rapid uptake of new monitoring technologies by persons living with diabetes and uncertainty among health-care professionals prompted a review of evidence emerging since our previous recommendations for "Monitoring Glycemic Control" (2). We have updated the title for this topic to align with Diabetes Canada's position statement on "Language Matters" (3).

Methods

A consolidated search strategy (for adults, children and pregnant women) was developed by modifying and updating PICO (population, intervention, comparison and outcome) questions used for the 2018 CPG (chapters 9, 34, 35, 36). A systematic search of the literature for relevant articles published from November 1, 2017 to October 28, 2020 was performed by the health science librarians at the McMaster Evidence Review and Synthesis Team (MERST). The MERST team reviewed all relevant citations at title, abstract and full-text levels. Relevant citations were abstracted and critically reviewed by a methodologist from MERST. All MERST staff (librarians and methodologists) were without financial or intellectual conflict. The full-text citations and critical appraisal reports were provided to the expert working group. Members of the expert working group were selected by the CPG Steering Committee with the goal of ensuring representation of diverse perspectives (across disciplines, and academic and community settings), appropriate content and methodologic expertise, while limiting the potential of financial conflict, as much as possible. Diabetes Canada has a formal policy to manage conflict of interest for the CPG Steering Committee.

The expert working group reviewed the citations, graded the evidence, drafted the revised recommendations and created the initial draft of the preamble document to accompany the revised recommendations. For this update, the CPG Steering Committee reviewed the cited evidence independently and suggested revisions to the draft recommendations and the text. The grading of recommendations was reviewed independently by the Independent Methods Review Co-Chair (D.R.). The finalized recommendations were unanimously approved by the CPG Steering Committee.

Change in Terminology

Glucose monitoring remains a cornerstone of diabetes management. It allows people living with diabetes and their health-care providers to assess glycemic status and adverse effects, and to determine the effectiveness of glucose lowering therapies. Testing of glycated hemoglobin (A1C) continues to be the primary modality to ensure that glycemic goals are being met and the recommended frequency of testing remains unchanged. However, A1C is a measure of chronic glycemic levels over months and does not provide information that can inform immediate/short-term decisions. To measure glucose levels in real time, different modalities exist currently and new technologies are being studied. To address this

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Table 1
Terminology for different glucose monitoring modalities

New term	Previous term	Definition
Capillary blood glucose (CBG)	Self-monitored blood glucose (SMBG)	Determination of glucose in the capillary blood using finger sticks
Intermittently scanned continuous glucose monitoring (isCGM)	Flash glucose monitoring (FGM)	Measurement of interstitial fluid glucose via intermittent scanning of sensing device
Real-time continuous glucose monitoring (rtCGM)	Continuous glucose monitoring	Measurement of interstitial fluid glucose via a sensing device that is continuously transmitting the data to a device with real-time display for viewing at any time
Masked continuous glucose monitoring (mCGM)*	Professional continuous glucose monitoring	Measurement of interstitial fluid glucose via a sensing device that stores the data to be retrieved at a later time

* mCGM is a diagnostic tool for use by diabetes care providers, not for diabetes self-management.

expanding field, the terminology used to describe the different modalities needs to adapt to allow for future growth and has been updated in Table 1.

Strength of Wording

To maintain consistency with other chapters in the 2018 CPG, the language within the recommendations has been modified, such that interventions supported by Grade A, Level 1 evidence, and confirmed as appropriate through clinical experience, are now written as “should be used” in place of the previous language of “may be offered.” The population, intervention and expected outcome benefit is clearly indicated in each recommendation and the action language should reflect the confidence in the evidence provided.

Real-Time Continuous Glucose Monitoring (rtCGM)

For people living with type 1 diabetes who use basal-bolus injection therapy or continuous subcutaneous insulin infusion (CSII), rtCGM has been shown to reduce A1C (4–9) and increase glucose time in range (TIR) (5,7,8,10), while simultaneously reducing duration and incidence of hypoglycemia (5,7–11) in adults and children. These glycemic benefits of rtCGM have been demonstrated in trials recruiting adults and children with A1C at target (<7.5%) (6) or above target (4–6,9); and in trials which included adults at or above target (8). As well as reducing biochemical (i.e. not necessarily symptomatic) hypoglycemia, rtCGM has been shown to reduce episodes of severe hypoglycemia in adults with a history of severe hypoglycemia or impaired awareness of hypoglycemia using multiple daily injections (MDI) (11). rtCGM has also been shown to improve quality of life and hypoglycemia distress in adults with type 1 diabetes (11–13).

For people living with type 2 diabetes using basal-bolus injection therapy, a randomized controlled trial of 158 subjects demonstrated that the use of rtCGM reduced A1C to a greater extent than usual care, with more time spent in the target range and less time spent above range at 24 weeks (14). Therefore, it is now recommended that rtCGM may be used to improve glycemic levels in those with type 2 diabetes on basal-bolus injection therapy, with a reminder that successful use of rtCGM is dependent on the duration of time it is used, along with the importance of providing it in association with structured education and therapeutic programs (see section Importance of Diabetes Self-Management Education).

Intermittently-Scanned Continuous Glucose Monitoring (isCGM)

The use of isCGM has been shown to be beneficial for people living with type 1 or type 2 diabetes using insulin therapy to decrease time spent in hypoglycemia (15–17). Randomized controlled trials of isCGM compared to capillary blood glucose (CBG) testing in type 1 and type 2 diabetes have not consistently demonstrated differences in A1C (18). However, in a recent health technology assessment, other glucose parameters have been shown to improve. Compared with CBG testing, people using isCGM spent, on average, 1 hour more in target glucose range (95% confidence interval [CI] 0.41–1.59) and 22 minutes less in a high glucose range (95% CI −0.69 to −0.05) per day and less glucose variability among those with type 1 diabetes (19). A meta-regression, which included clinical trials and observational studies (which are subject to a number of biases) in type 1 and type 2 diabetes, suggested isCGM could reduce A1C by 0.55%, with the magnitude of A1C reduction being proportional to baseline A1C (20). However, as is true with any form of glucose monitoring, the act of monitoring may not of itself improve glucose levels, but, rather, provide data that permits users and providers to take actions to impact glucose levels underlying the importance of diabetes self-management education (see below).

Comparison of rtCGM and isCGM in People With Type 1 Diabetes

Two studies have directly compared rtCGM with isCGM in adults with type 1 diabetes. rtCGM users spent more TIR and less time below range (TBR) than isCGM users in a 5-week randomized study in adults with normal awareness of hypoglycemia using MDI or CSII (21). In an 8-week study of individuals with impaired awareness of, or recent severe hypoglycemia using MDI, rtCGM reduced time in hypoglycemia and fear of hypoglycemia, which was not seen with isCGM (22). Superiority of rtCGM to protect from hypoglycemia in this high-risk population was supported in the extension phase of this study, where switching to rtCGM was associated with significant reduction in TBR in subjects originally randomized to isCGM (23).

Masked Continuous Glucose Monitoring

A pragmatic, open-label 12-month study of the use of masked CGM every 3 months, for 5 to 14 days before their clinical visit, compared to usual clinical care among those with type 2 diabetes in general practice, showed no difference in the primary endpoint of A1C at 12 months (24), but there was an increase in TIR at 12 months and lower A1C at 6 months. Similarly, a randomized study of 148 people living with type 2 diabetes treated with insulin

compared the effects of masked CGM and usual care with CBG testing in primary and secondary care settings and did not show a difference in the primary endpoint of TIR but did show a greater reduction in A1C with no increase in hypoglycemia (25). Given the conflicting data regarding the effects of the use of masked CGM, no recommendation can be made at this time.

Glucose Monitoring in Women With Diabetes During Pregnancy

Accuracy of rtCGM and isCGM in pregnancy

In a study of the performance of rtCGM (Dexcom G6) in 32 pregnant women with diabetes (type 1, type 2 and gestational diabetes) across sensor wear sites, accuracy of rtCGM was acceptable (overall mean absolute relative difference [MARD] was 10.3%) when compared to venous glucose measures, which were taken during a period of 6 hours when participants were allowed to eat freely. rtCGM was also found to be acceptably accurate in the hypoglycemic range (<3.8 mmol/L), with a mean absolute difference of 0.5 mmol/L between 3-3.8 mmol/L and 0.35 mmol/L at glucose levels of 2.2-3.0 mmol/L. Comparing different sites, the posterior upper arm was found to be most accurate, with a MARD of 8.7%, followed by the buttock (11.2%) and the abdomen (11.5%) (26).

The use of isCGM in pregnant women with diabetes has also been studied for accuracy and safety. In a study of 74 pregnant women with type 1, type 2 or gestational diabetes, isCGM was found to have good agreement with CBG (overall MARD 11.8%), with high levels of user satisfaction (27).

Glucose monitoring in pregnant women with type 1 and type 2 diabetes

The Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy (CONCEPTT) trial randomized 325 women (215 pregnant and 110 planning pregnancy) with type 1 diabetes, to rtCGM, in addition to CBG testing or CBG testing alone (28). Pregnant rtCGM users spent more time in the target range of 3.5 to 7.8 mmol/L (68% vs 61%, p=0.0034) and less time above the range (>7.8 mmol/L) (27% vs 32%, p=0.0279) than did pregnant participants using CBG testing alone, with comparable severe hypoglycemic episodes and time spent with hypoglycemia. Neonatal health outcomes were significantly improved, with a lower incidence of large for gestational age (LGA) infants (OR 0.51, 95% CI 0.28–0.90, p=0.021), fewer neonatal intensive care unit (NICU) admissions lasting more than 24 hours (OR 0.48, 95% CI 0.26–0.86, p=0.0157), and a lower risk of neonatal hypoglycemia (OR 0.45; 95% CI 0.22–0.89, p=0.025). No benefit was observed for women planning a pregnancy (28). A budget impact model, where the National Health Service in England was used, estimated the total cost of pregnancy and delivery in women with type 1 diabetes using CBG testing with or without rtCGM. The potential annual cost savings of using rtCGM was estimated to be approximately £9.5 million, with the principal driver being reduced need for NICU and reduced duration of stay in NICU (29). Taken together, these data support updating the recommendation that rtCGM should be used in women with type 1 diabetes during pregnancy to improve blood glucose levels, and to reduce the risk for LGA infants, neonatal hypoglycemia and NICU admissions >24 hours.

To date, there have been no randomized trials using isCGM in pregnant women with type 1 or type 2 diabetes. In an observational cohort study of 186 women with type 1 diabetes attending pregnancy care at 2 tertiary care antenatal clinics in Sweden (92 women used rtCGM and 94 women used isCGM), TIR (3.5 to 7.8 mmol/L) was similar in the 2 groups, although time spent in hypoglycemia was higher in the isCGM group. Pregnancy outcomes were associated with CGM metrics and the incidence of LGA was similar in the 2 groups (52% rtCGM vs 53% isCGM) (30). The TIR achieved in this observational study (reaching 60% in the third trimester) was similar to the control arm, but lower than the intervention arm of CONCEPTT. While isCGM has not yet been shown to reduce neonatal morbidity in women with type 1 diabetes, these data are reassuring, but these observational data are not sufficient to conclude non-inferiority. Achieving optimal glycemic targets is more important than the technology employed. The effectiveness of rtCGM or isCGM for glycemic or fetal outcomes has not yet been studied in pregnant women with type 2 diabetes.

Glucose monitoring in pregnant women with gestational diabetes

Frequent CBG testing is essential to guide management of gestational diabetes (31). Both fasting and postprandial testing are recommended to guide therapy in order to improve fetal outcomes (32). In a randomized trial of 293 women with newly diagnosed gestational diabetes, after 1 week of daily CBG testing (4 times per day: fasting and 2 hours postprandial), women who did not require pharmacotherapy were randomized to testing (4 times per day), either daily or every other day (33). The alternate day approach was non-inferior for birthweight and there were no differences in the need for medical therapy, gestational age of delivery, rate of LGA or preeclampsia. Consistent use of CBG testing was found to be higher in the every-other-day group (89% compared with 92%, p=0.01). It is, therefore, reasonable to reduce testing to every other day after 1 week of testing daily, if glucose levels do not indicate the need for pharmacotherapy.

There have been no new randomized trials or cohort studies using rtCGM or isCGM in women with gestational diabetes since 2018. More studies are needed to assess the benefits of rtCGM or isCGM in women with gestational diabetes.

Glucose Monitoring in Children and Adolescents With Diabetes

CBG testing

Among children and adolescents with type 1 diabetes, frequent CBG testing (4 or more tests per day) was associated with lower A1C (34,35). In youth with type 2 diabetes on noninsulin antihyperglycemic therapy or insulin, low frequency of CBG testing was associated with higher A1C (36).

rtCGM

Two of 3 randomized controlled trials which included children as young as 6 years, comparing rtCGM to CBG testing, showed lower A1C and less TBR in both adults and children (7,9), but this was not seen in pediatric participants in the other study, which had very low use of rtCGM and was under-powered to detect differences in hypoglycemia (37). Lower A1C with rtCGM in children may depend on time spent using CGM since further analysis of pediatric subjects in this latter trial showed use of rtCGM for 6 or more days per week improved A1C by -0.8 ± 0.6% at 12 months (38). Characteristics, such as younger age and higher frequency of CBG testing prior to rtCGM, may help predict those who are more likely to use rtCGM consistently (39). Another study in younger children (ages 4 to 10 years) did not show any change or differences in A1C or CGM parameters between groups, although the use of rtCGM was associated with a high degree of parental satisfaction with rtCGM (40). These findings underscore a fear of hypoglycemia which is reflected in more conservative recommended glucose targets. In randomized

Table 2
Glucose metrics that can be derived from continuous glucose monitoring* (47,48) and recommended targets from the International Consensus Report for most individuals with type 1 or type 2 diabetes (excluding pregnancy, children/adolescents, and older/high-risk groups) (49)

Glucose metric	Recommended targets (for most individuals with type 1 or type 2 diabetes)	Comments
Glucose Management Indicator (GMI)		
Approximate A1C level based on the average glucose levels from CGM readings for 14 or more days	≤7.0%	GMI may differ from measured A1C as it is reflective of glucose values during the period being assessed during CGM interpretation (last 14 days, last 30 days)
Glycemic Variability		
Reported as % coefficient of variation (%CV) = Standard Deviation/Mean Glucose	≤36%	Lower %CV has been associated with reduced rates of hypoglycemia
Time In Range (TIR)		
% of values between 3.9-10.0 mmol/L	>70%	70% TIR equates to an A1C of about 7.0%. Each 10% TIR equates to about 0.5% change in A1C
Time Below Range (TBR)		
Level 1: % of values 3.8-3.0 mmol/L	<3.0%	Total % of values <3.9 mmol/L (includes Levels 1 and 2) should be <4% for most individuals
Level 2: % of values <3.0 mmol/L	<1.0%	
Time Above Range (TAR)		
Level 1: % of values 10.1-13.9 mmol/L	<20%	Total % of values >10.1 mmol/L (includes Levels 1 and 2) should be <25% for most individuals
Level 2: % of values >13.9 mmol/L	<5%	

A1C, glycated hemoglobin; CGM, continuous glucose monitoring.
* Recommended to use CGM regularly (>70% of a 14-day period).

controlled trials (37,40) and observational studies (41,42) of rtCGM, the rates of severe hypoglycemia were low, making it difficult to assess the effect of rtCGM on rates of severe hypoglycemia.

isCGM

An open label study of isCGM in 76 children aged 4 to 17 years with type 1 diabetes using CSII or MDI showed lower A1C and more TIR, with no change in TBR (which was low at baseline) (43). A randomized trial of isCGM in adolescents (ages 13 to 20 years) with A1C >9% at baseline showed no advantage to reduce A1C but was associated with increased frequency of blood glucose monitoring and greater treatment satisfaction (44). Switching from CBG testing to isCGM among children and adolescents with type 1 diabetes was associated with a reduction in severe hypoglycemia but no reduction in A1C in a Belgian observational study (45). Of note, 15.8% of those who switched to isCGM reverted back to CBG testing after a median use of 5.3 months. A small, 2-week camp study showed isCGM was non-inferior to CBG testing in children aged 6 to 15 with type 1 diabetes using CSII (46). A meta-regression including trials and observational data suggested that isCGM may be associated with a mean reduction in A1C of 0.54% in the pediatric subgroup (20).

Hypoglycemia in children with type 1 diabetes

Avoidance of severe hypoglycemia in children is of particular concern for families and providers. Safety is a primary concern in trial design and, fortunately, severe hypoglycemia during clinical trials is a rare event and, therefore, difficult to study. Although a definitive statement regarding the effectiveness of rtCGM to reduce severe hypoglycemia in children is not possible, observations of reductions in severe hypoglycemia in adults and less TBR in children suggest inference of the potential for benefit is plausible.

Type 2 diabetes

No studies have examined the effectiveness of either rtCGM or isCGM in children and/or adolescents with type 2 diabetes. CGM could be offered, as an alternative to CBG testing, if preferred by the individual as part of training, education and support in self-management.

Glucose Metrics

When continuous glucose data are captured, it is possible to generate glucose metrics, including TIR, time above range (TAR), TBR and glycemic variability (standard deviation or coefficient of variation), which may be summarized along with the ambulatory glucose profile (see Table 2) (47). These metrics provide additional complementary glycemic data to assess blood glucose levels and identify potential areas for intervention. As the use of technologies allowing for CGM increases, clinicians will need to become more comfortable with the interpretation of these glucose metrics and international consensus groups have provided guidance and proposed targets (see Tables 2-4) (45,47–49).

Importance of Diabetes Self-Management Education

The importance of diabetes self-management education when introducing or using newer glucose monitoring technologies has been clearly illustrated in recent trials. A randomized controlled trial

Table 3
Recommended CGM targets for older/higher risk individuals (excluding pregnancy, children/adolescents) (49)

Glucose metric	Older/High-risk individuals	Comments
Time In Range (TIR)		
% of values between 3.9-10.0 mmol/L	>50%	50% TIR equates to an A1C of about 8.0%. Each 10% TIR equates to about 0.5-0.8% change in A1C
Time Below Range (TBR)		
Level 1 and 2: % of values <3.9 mmol/L	<1.0%	In older/high-risk individuals using insulin or sulfonylureas, avoidance of hypoglycemia is a priority *
Time Above Range (TAR)		
Level 1: % of values 10.1-13.9 mmol/L	n/a	Some glucose values between 10.1-13.9 mmol/L are acceptable. Minimizing time higher than this is preferred
Level 2: % of values >13.9 mmol/L	<10%	

A1C, glycated hemoglobin; *CGM*, continuous glucose monitoring.
* In individuals NOT using insulin or sulfonylureas, CGM values <3.9 mmol/L may not indicate true or clinically significant hypoglycemia.

Table 4
Recommended CGM targets for pregnancy (48). Note limited evidence.

Glucose metric	Type 1 diabetes pregnancy	Type 2 diabetes/Gestational diabetes
Time In Range (TIR)		
% of values between 3.5-7.8 mmol/L	>70%	Not known*
Time Below Range (TBR)		
% of values 3.1-3.4 mmol/L	<3.0%	Not known*
% of values <3.0 mmol/L	<1.0%	Not known*
Time Above Range (TAR)		
Level 1: % of values >7.8 mmol/L	<25%	Not known*

CGM, continuous glucose monitoring.
* Insufficient evidence to permit recommendations for type 2 and gestational diabetes (see ref 46 for discussion).

of a structured educational program conducted in 216 people on basal-bolus injection therapy for type 1 or type 2 diabetes who were using or starting isCGM demonstrated that structured education resulted in greater A1C reduction, TIR and reduced diabetes-related distress, compared to usual care (50). The structured program was designed to increase understanding and use of the available glucose information by the individual to optimize diabetes treatment. It emphasized principles of isCGM, analysis of glucose values and trends, recognition of glucose patterns, therapy adjustments based on those glucose patterns, and psychosocial impact of isCGM.

In the high-risk setting of impaired awareness of hypoglycemia or history of severe hypoglycemia, structured education per se was effective to restore hypoglycemia awareness and to reduce frequency of severe hypoglycemia whether CBG testing or rtCGM were used (51). The trial may have underestimated the value of rtCGM which was used only 57% of the time, and greater use of rtCGM was associated with less time in hypoglycemia (TBR) (51 see Supp Table 6). In the Hypo-DE study, where sensors were used 90% of the time, rtCGM reduced incidence and duration of hypoglycemia events (11).

More guidance around self-management education and self-management support is provided in the 2018 CPG (52).

Recommendations for Adults, Children and Adolescents with Diabetes (changes are in bold)

1. In most **individuals***, A1C should be measured approximately every 3 months to ensure that glycemic goals are being met or maintained [Grade D, Consensus]. In some circumstances, such as when significant changes are made to therapy, or during pregnancy, it is appropriate to check A1C more frequently. Testing at least every 6 months should be performed in adults during periods of treatment and healthy behaviour stability when glycemic targets have been consistently achieved [Grade D, Consensus].
2. In **individuals*** using insulin more than once a day, CBG testing should be used as an essential part of diabetes self-management [Grade A, Level 1 (53) for type 1 diabetes; Grade C, Level 3 (54) for type 2 diabetes; **Grade C, Level 3** (33,34)**, for children and adolescents**] and should be undertaken at least 3 times per day [Grade C, Level 3 (54,55)] and include both pre- and postprandial measurements [Grade C, Level 3 (55–57)]. For individuals with type 2 diabetes (**including children and adolescents**) on once-daily insulin, in addition to noninsulin antihyperglycemic agents, testing at least once a day at variable times is recommended [Grade D, Consensus].
3. In **individuals*** with type 2 diabetes not receiving insulin therapy, the recommended frequency of CBG testing should be individualized depending on type of antihyperglycemic agents, A1C level and risk of hypoglycemia [Grade D, Consensus].
   a) When A1C targets are not being reached, **structured** CBG testing should be instituted (**including a 7-point profile; fasting, preprandial/2-h postprandial at each meal, bedtime; every 1-3 months) to improve A1C [Grade B, Level 2** (58–60)** for adults; Grade D, Consensus for children and adolescents**].
   b) If achieving A1C targets or receiving antihyperglycemic medications not associated with hypoglycemia, **daily CBG testing is not recommended except during illness or at risk of hyperglycemia (e.g. surgery, steroid treatment) when more frequent testing may be required** [Grade D, Consensus].
4. In all **individuals*** with diabetes, more frequent CBG testing (4 times per day and/or overnight) **is recommended when A1C is not at target or there are episodes of hypoglycemia, to identify the most safe and effective clinical approach to improve blood glucose levels** [Grade D, Consensus].
5. In individuals* with type 1 diabetes **using basal-bolus insulin therapy or CSII**, who are willing and able to use these devices on a nearly daily basis:
   a) **rtCGM should be used** to
      i. **reduce A1C and increase TIR** [Grade A, Level 1A (4–8,10)]
      ii. reduce duration **and incidence** of hypoglycemia [Grade A, Level 1A (5,7,8,10,11)]
      iii. **improve aspects of diabetes-specific quality of life (in adults)** [Grade B, Level 2 (12,13)]
      iv. **increase treatment satisfaction (in adults using CSII)** [Grade B, Level 2 (61)
   b) **isCGM** may be used to
      i. **increase TIR** [Grade B, Level 2 (17,60) for adults; Grade C, Level 3 (43) for children]
      ii. reduce **frequency** and duration of hypoglycemia (TBR) [Grade B, Level 2 (15,17) for adults]
      iii. **increase treatment satisfaction** [Grade C, Level 3 (15,17,44)]
6. In adults with type 1 diabetes with impaired awareness of hypoglycemia or recent severe hypoglycemia:
   a) **rtCGM should be used to reduce incidence of hypoglycemia and severe hypoglycemic events [*Grade A, Level 1A* (11)] compared with CBG testing**
   b) **rtCGM is recommended to reduce time in hypoglycemia compared with isCGM [Grade B, Level 2** (23)**]**
7. **In adults with type 2 diabetes using basal-bolus insulin therapy who have not achieved their A1C target, who are willing and able to use these devices on a nearly daily basis:**
   a) **rtCGM may be used to reduce A1C and duration of hypoglycemia (TBR) [Grade A, Level 1A** (14)**]**
   b) **isCGM may be used as an alternative to CBG testing to reduce frequency and duration of hypoglycemia (TBR) [Grade B, Level 2** (16)**]**

*Includes adults, children and adolescents

8. In pregnant women with type 1 diabetes, rtCGM **should be used** to increase TIR and reduce TAR and reduce the risk of LGA infants, neonatal hypoglycemia and NICU admissions >24 hours [Grade A, Level 1A (28)].
9. **Women with gestational diabetes or type 2 diabetes during pregnancy:**
   a) **should be requested to perform CBG testing 4 times daily (fasting and postprandially) for 1 week to assess blood glucose levels and need for pharmacotherapy.**
      i. **in women who do not require antihyperglycemic medications, CBG testing can be reduced to 4 times per day on alternate days [Grade B, Level 2 (33)]**
      ii. **in women who require insulin therapy, CBG testing should be performed 4 times daily, both fasting and postprandially, to improve pregnancy outcomes [Grade B, Level 2 (32)]**
10. If CBG meter readings are suspected to be inaccurate or are discordant from A1C, CBG results should be compared with a simultaneous laboratory measurement of venous blood glucose [Grade D, Consensus].
11. Individuals* with type 1 diabetes should:
    a) be instructed to perform ketone testing during periods of acute illness, particularly in the presence of preprandial blood glucose levels >14.0 mmol/L or in the presence of symptoms of diabetic ketoacidosis (DKA) [Grade D, Consensus].
    b) Blood ketone testing methods may be preferred over urine ketone testing, as they have been associated with earlier detection of both ketosis and response to treatment [Grade B, Level 2 (62)].

Author Disclosures

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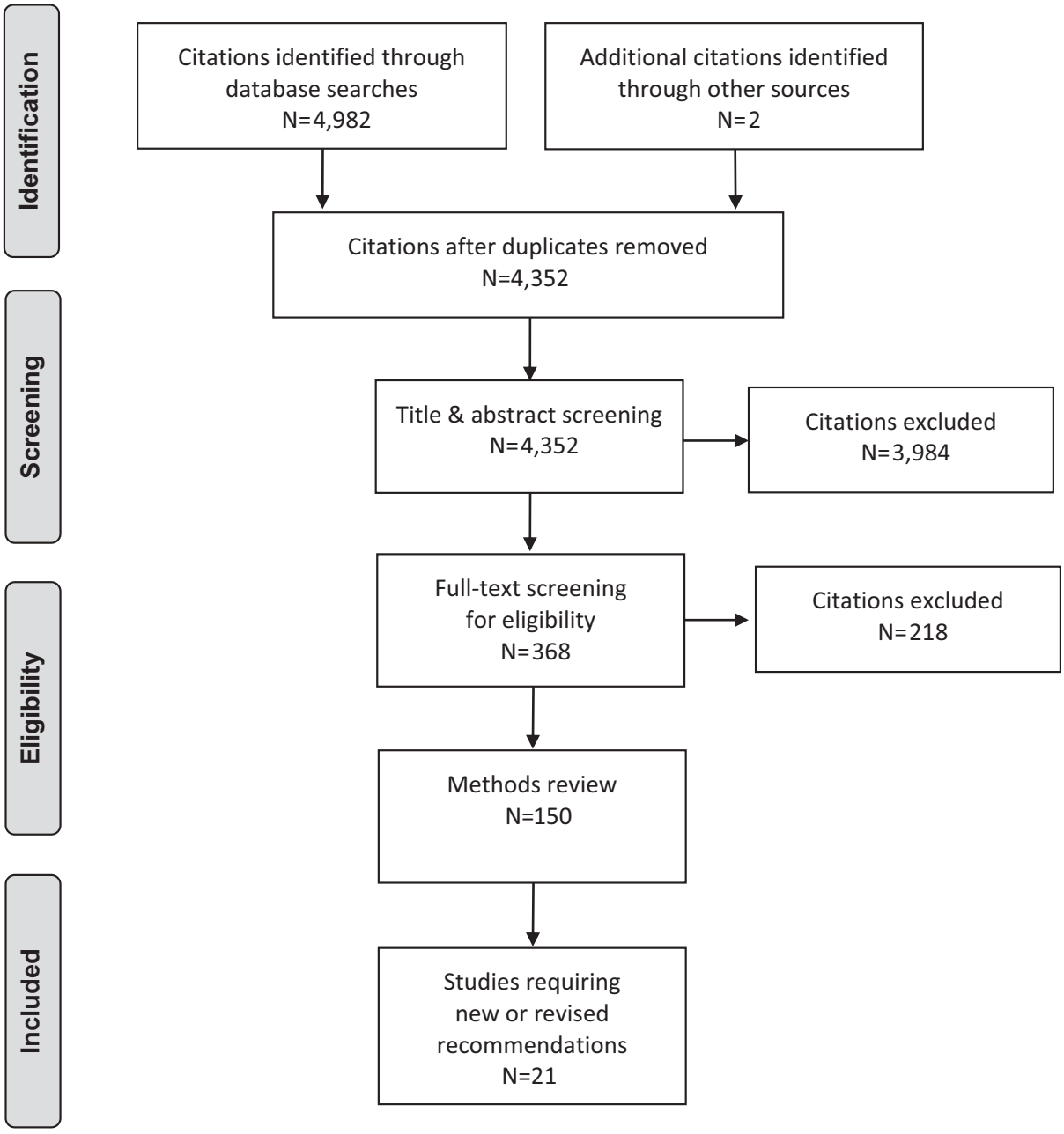
Literature Review Flow Diagram for 2021 Update: Blood Glucose Monitoring in Adults and Children with Diabetes

– Update of 2018 Guidelines



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