**Clinical Pearls**

- Goal of blood glucose (BG) testing: Inform therapy decisions to help assess the effectiveness of glucose lowering interventions, prevent hypoglycemia and provide feedback to patients on lifestyle interventions.
- For individuals using insulin ≥1 time/day, SMBG should be used as an essential part of diabetes self-management for T1DM and T2DM.
- If not using insulin or secretagogues, consider if self-management for T1DM is appropriate.
- For individuals using insulin ≥1 time/day, SMBG not using insulin or secretagogues should be considered.
- Increasing use of flash glucose monitoring (FGM) & continuous glucose monitoring (CGM).

### Table 1: Recommendations for Self-Monitoring Blood Glucose (SMBG) in People with Type 2 Diabetes

| Type 2 Diabetes | Evidence Summary for SMBG | Bottom Line
|----------------|---------------------------|-------------------|
| Diet alone or prediabetes | SMBG vs no SMBG: Improvements in glycemic control were less pronounced (ΔA1c = 0.05%) and not statistically significant. | Routine SMBG is not required. May be considered for feedback to new patients on the effects of lifestyle interventions.
| Not using insulin | • Self-testing (>7 times per week) is associated with a statistically significant, but not clinically relevant, improvement (ΔA1c = 0.25%).<sup>DC'16, Young '17</sup>
• Benefits are small up to 6 mos (ΔA1c = 0.3%) & subside by 12 mos. Cochrane: Malanda et al '12
• No studies have determined whether SMBG shows benefit for hard diabetes endpoints such as reduction in blindness, kidney damage, MI or mortality.
• An association with depression and lower quality of life has also been noted. | Routine SMBG is not required.
• The small reduction in A1c does not translate to better glycemic control or quality of life.
• Periodic testing in some situations (see Table 3), but only if it helps to determine a specific course of action (e.g. self-directed dose adjustments).
| Using insulin | Low quality evidence suggests the use of SMBG appears to be associated with improvements in glycemic control.
• There is insufficient evidence to determine the optimal frequency and this should be individualized. Preformed SMBG at least as often as insulin is being given. | Basal insulin (<2 times per day): Individualize frequency, usually not more than 14 times per week (e.g. SMBG 2x per day).
• Basal-prandial insulin: Individualize frequency to guide adjustments in insulin therapy (see Table 2).

### Table 2: Self-monitoring blood glucose, when?<sup>DC'18</sup>

<table>
<thead>
<tr>
<th>Situation</th>
<th>SMBG Frequency Recommendation</th>
<th>Test Strip &amp; Lancet Coverage</th>
<th>Table 3: Consider More Frequent SMBG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diabetes Canada SMBG Recommendation Tool (HCP):</strong></td>
<td>200 per year (3-4/week)</td>
<td>Hypoglycemia risk: ↑ risk = 400 per year; ↓ risk = 200 per year</td>
<td>Unstable glucose levels; SMBG ≥ 2 times per day until targets are met.</td>
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<tr>
<td><strong>Non-insulin pharmacotherapy</strong></td>
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<td>Medications with ↑ risk of hypoglycemia (e.g. insulin or insulin secretagogues).</td>
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<tr>
<td>If achieving targets or using medications not associated with hypoglycemia:</td>
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<td>Hypoglycemia unawareness due to decreased counter regulatory hormones.</td>
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<tr>
<td>• Infrequent SMBG is appropriate</td>
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<td>Nocturnal hypoglycemia (night sweats, nightmares): intensive insulin regimens; occasionally monitor overnight BG levels at peak action time of HS insulin&lt;sup&gt;DC'18&lt;/sup&gt;.</td>
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<tr>
<td>If glycemic control not achieved:</td>
<td></td>
<td></td>
<td>More info on assessment and management of hypoglycemia, see page 53.</td>
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<td>Consider at staggering times (e.g. periodic pre- &amp; 2h post-prandial)</td>
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<td></td>
<td>Medication changes, major changes in diet/activity (e.g. ↑ SMBG for 1-2 weeks).</td>
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<td></td>
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<td>Acute illness or hospitalization (e.g. risk of hyperglycemia with infection).</td>
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<td>Prolonged exercise with ↑ HR; check BG before &amp; after exercise, monitor for sx occupation where hypoglycemia poses safety concerns (e.g. machinery, driving).</td>
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<tr>
<td>Basal (typically given HS)</td>
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<td></td>
<td>SMBG when symptoms of hypoglycemia occur or have previously occurred.</td>
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<td>At least as often as insulin is being given.</td>
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<td></td>
<td>Starting medications known to cause hyperglycemia (e.g. corticosteroids, see pg 52).</td>
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<td>T2DM: daily at variable times:</td>
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<td>Peri-pregnancy and gestational diabetes: see RxFiles Peri-Pregnancy Chart pg 173.</td>
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<tr>
<td>Premixed (typically ac; breakfast &amp; supper)</td>
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<td>Newly diagnosed (&lt;6 mos): SMBG ≥ 1 time per day (at different times of day) to learn the effects of meals, exercise and medications&lt;sup&gt;DC'18&lt;/sup&gt;.</td>
</tr>
<tr>
<td>At least as often as insulin is being given.</td>
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</table>
Background considerations:

- **Weighing the benefits & risks of intensive therapy**: [See also Diabetes - Landmark Outcome Trials Chart]
  - The results of clinical trials evaluating outcomes of intensive glycemic control have been somewhat disappointing. Achieving an A1c of less than 6.5% may ↓ microvascular endpoints, but over 100,000 patient years of RCT data have failed to show a benefit on CV endpoints. (The 10 year observational follow-up to the UKPDS suggests CV benefit of intensive glycemic control (FBG <6; mean baseline A1c 7.9% vs 8.5%) especially with metformin.)
  - Individualization of antihyperglycemic therapy has become a common theme as some evidence & experience suggests that some patients may do worse with more intensive regimens (e.g. mortality (NNH=95/3.5yrs) in patients randomized to achieve an intensive A1c of 6% vs 7 - 8%; actual A1c achieved was 6.4% vs 7.5%).
  - Although an A1c of <7% is suggested for most, individual patient & treatment regimen factors may result in acceptance of less aggressive targets. For example the American Geriatric Society noted that an A1c of 8% may be more suitable in frail elderly & those with a life expectancy <5yrs.
  - A recent observational cohort trial found a “U” shaped curve for mortality related to A1c. An A1c of 7.5% was associated with the lowest mortality, with higher mortality seen at higher and lower A1c values.

If practice changes to reflect the evidence, $450 million to $1.2 billion* could be freed up between 2012 and 2015 for spending on antidiabetes interventions that are proven effective.

Patient health would not be affected negatively.

[These results were prepared using data from Brogan Inc., a unit of IMS, PharmaStat®, Public and Private Drug Plans Databases, 2000-2011]
References for SMBG meters:


Malanda UL, Welschen LM, Riphagen II, et al. Self-monitoring of blood glucose in patients with type 2 diabetes mellitus who are not using insulin. Cochrane Database Syst Rev. 2012 Jan 18;1:CD005060. [From this review, we conclude that when diabetes duration is over one year, the overall effect of self-monitoring of blood glucose on glycaemic control in patients with type 2 diabetes who are not using insulin is small up to six months after initiation and subsides after 12 months. Furthermore, based on a best-evidence synthesis, there is no evidence that SMBG affects patient satisfaction, general well-being or general health-related quality of life. More research is needed to explore the psychological impact of SMBG and its impact on diabetes specific quality of life and well-being, as well as the impact of SMBG on hypoglycaemia and diabetic complications.]


Additional articles for SMBG meters: