SMBG and New technology in Diabetes management

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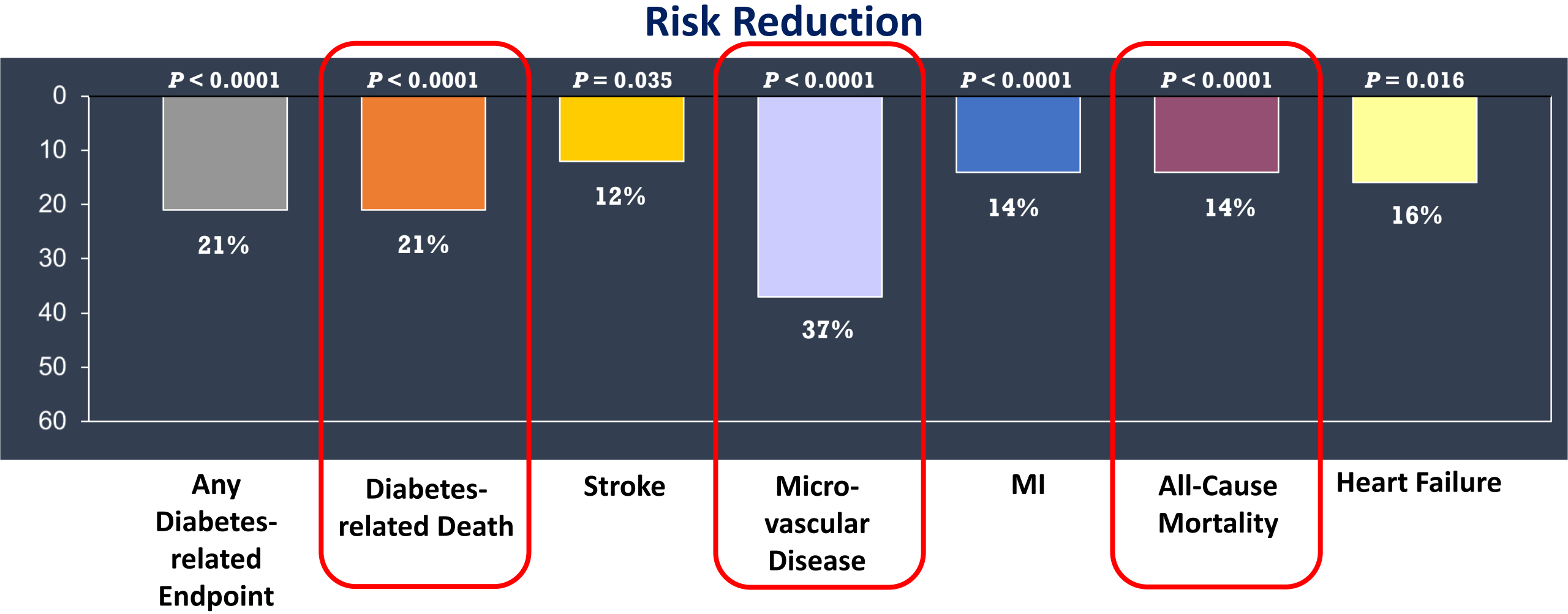
UKPDS 35
Each 1% Reduction in A1c Reduces the Complication Risk



Stratton IM, et al. BMJ. 2000;321:405-412.

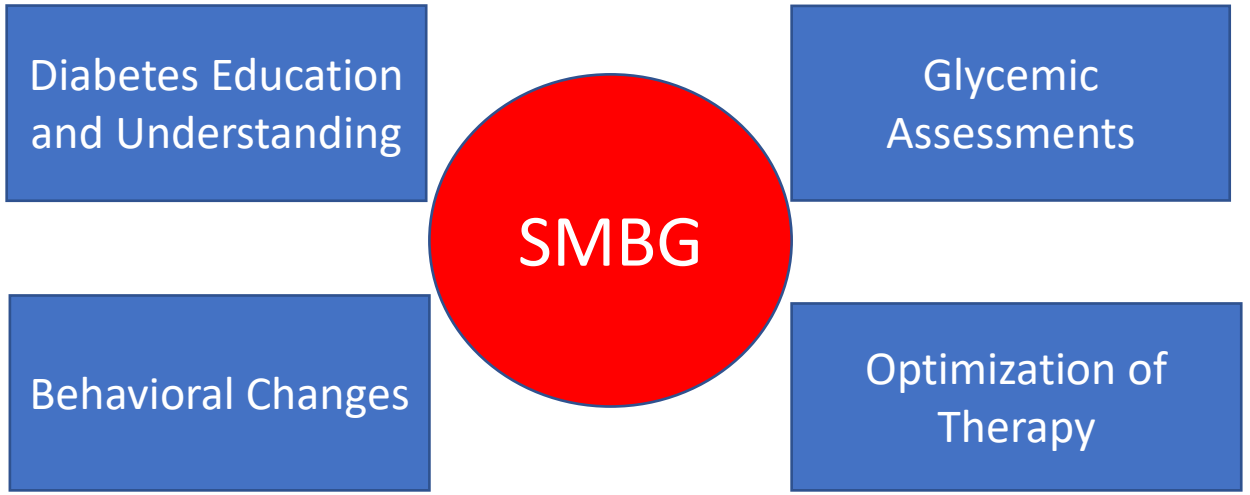
Glycemic Control

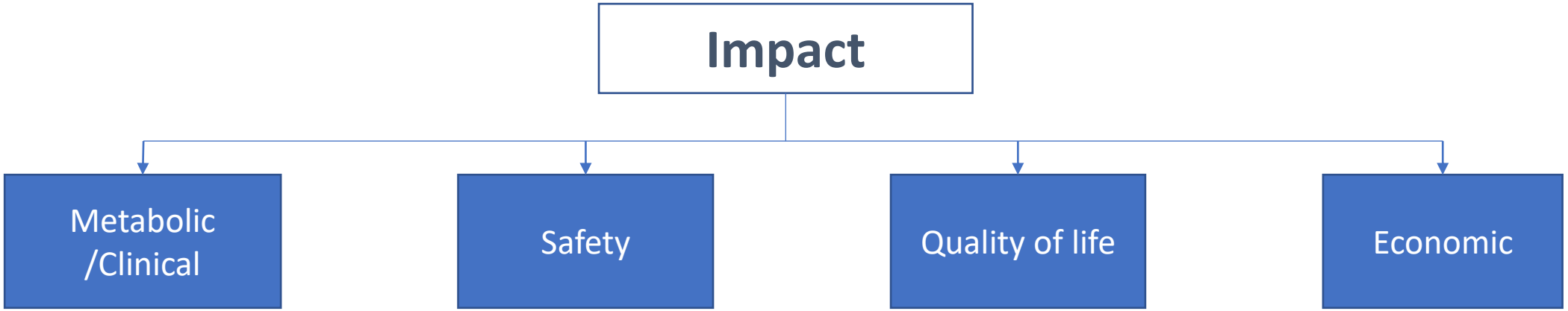
Following techniques are available for health providers and patients to assess the effectiveness of a management plan on glycemic control

- ✓ Self Monitoring Blood Glucose
- ✓ Continues Glucose Monitoring
- ✓ A1C

Standard of Medica care in Diabetes -2018 . Diabetes Care 2018 ;41

SMBG as a Component of the Education/Treatment Program





International Diabetes Federation 2009

Why Is SMBG So Important?

- A1c isn’t always accurate
- Blood sugar values improve when patients know their blood sugar readings
- Self monitoring let’s patients see how specific food and beverages choices affect blood sugar
- Patients can diagnose low blood sugar , as well as high, and make adjustments
- The physician needs to see the blood sugar patterns to problem solve
- Do not adjust medication based on the A1C:

  -It tells you nothing about when highs and lows are occurring

Is SMBG a Critical Component of Glycemic Success?

Makes sense that it would:

- Enhance patient understanding and motivation
- Provides HCP‟s and patients with crucial data needed for making decisions about treatment , A1C data alone is simply not enough

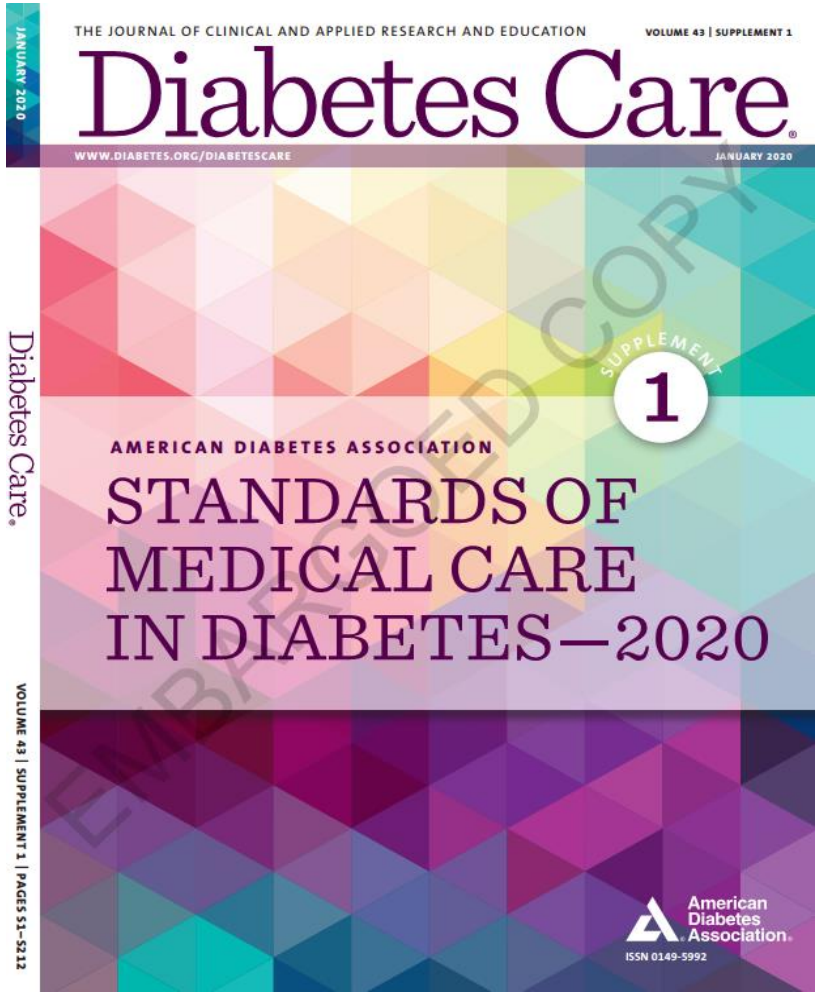
Why patients don’t perform SMBG …

- Lack specific instructions on how and when to test
- Cost
- Discomfort, inconvenience
- Hyperglycemia is asymptomatic – “no need to test”
- Not sure of what to do with information
- Their health care provider does not spend time reviewing and discussing glucose numbers with them

Why clinicians don’t utilize SMBG data …

- Data are not available
- patient doesn’t bring meter or logbook
- Patient brings meter but has no logbook or graphs
- Data difficult to access/download
- Patient checking infrequently
- Not enough time to analyze data
- Data difficult to analyze
- Uncertainty about moving from data to treatment choices

Self Monitoring Blood Glucose Recommendations- ADA



Patients on Intensive Insulin Regiments

- Prior to meals and snacks
- At bedtime
- Occasionally postprandially
- Prior to exercise
- When they suspect low blood glucose
- After treating low blood glucose until they are normoglycemic
- Prior to critical task such as driving

For many patients using SMBG, this will require testing up to 10 times daily

American Diabetes Association

Standard of Medica care in Diabetes -2020 . Diabetes Care 2020

Patients Using Basal Insulin and/or Oral Agents

- Patients using basal insulin, assessing fasting glucose with SMBG to inform dose adjustments to achieve blood glucose targets results in lower A1C.

- people with type 2 diabetes not using insulin, routine glucose monitoring may be of limited When prescribed as part of a board educational program , SMBG may help to guide treatment decisions and or self management for patients taking less frequent insulin injections B or non-insulin therapies. E

American Diabetes Association.

Standard of Medica care in Diabetes -2020 . Diabetes Care 2020

Self Glucose Monitoring Recommendations- **ADA**

- When used properly, CGM in conjunction with intensive insulin regimens is a useful tool to lower A1C in adults with type 1 diabetes who are not meeting glycemic targets. A

- CGM may be useful tool in those with hypoglycemia unawareness and/or frequent hypoglycemia episodes. C

- Given the variable adherence to CGM, assesses individual readiness for continuing CGM use prior to prescribing. E

American Diabetes Association

Standard of Medica care in Diabetes -2020 . Diabetes Care 2020

Potential Uses of SMBG

Diabetes Education and Understanding

- SMBG helps patients gain understanding of their disease

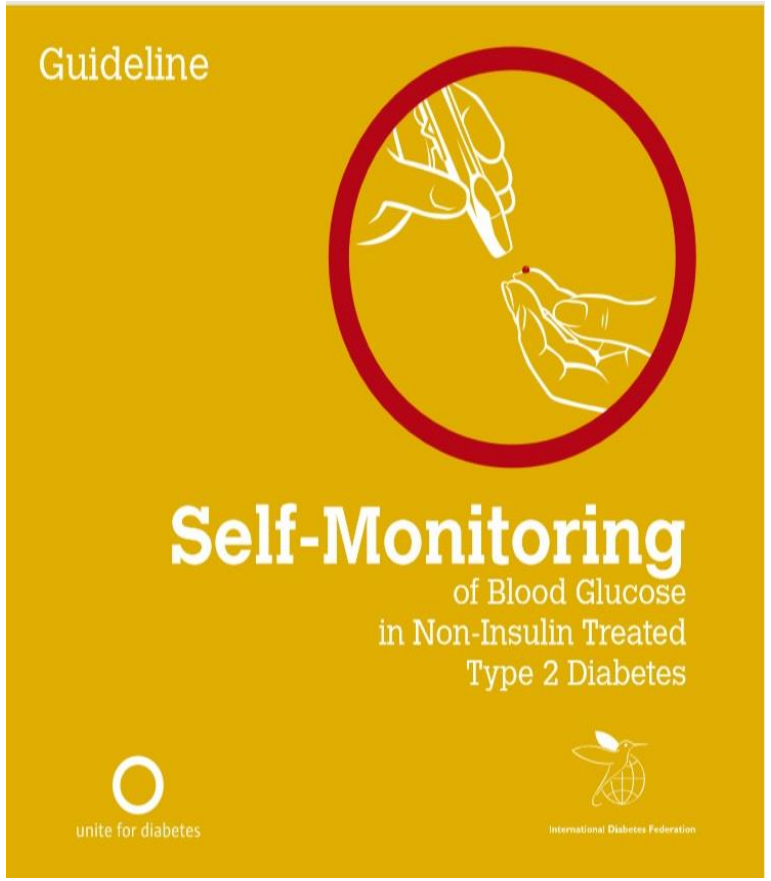
Behavioral Change

- SMBG provides immediate feedback when patients make changes in their health behaviors

Glycemic Assessment

- SMBG enables patients and HCPs to identify glycemic excursions/abnormalities and assess overall glycemic status

Optimization of Therapy



International Diabetes Federation 2009

Recommendations for SMBG Use in Non-Insulin Treated Diabetes

SMBG should be used only when individuals with diabetes (and/or their care-givers) and/or their healthcare providers have the **knowledge**, **skills** and **willingness** to incorporate SMBG monitoring and therapy adjustment **into their diabetes care plan** in order to attain agreed treatment goals.

International Diabetes Federation

Recommendations for SMBG Use in Non-Insulin Treated Diabetes

SMBG should be considered at the time of diagnosis to enhance the understanding of diabetes as part of their education and to facilitate **timely treatment initiation** and titration optimization.

International Diabetes Federation

Recommendations for SMBG Use in Non-Insulin Treated Diabetes

SMBG should be considered as part of ongoing diabetes self-management education to assist people with diabetes to better understand their disease and provide a means to actively and effectively participate in its control and treatment, **modifying** behavioral and pharmacologic **interventions** as needed, in consultation with their healthcare provider.

International Diabetes Federation

Recommendations for SMBG Use in Non-Insulin Treated Diabetes

SMBG protocols (intensity and frequency) should be **individualized** to address each individual's specific

- educational
- behavioral
- clinical requirements (identify/prevent/manage acute hyper- and hypoglycaemia)

and provider requirements for data on glycemic patterns and monitor impact of therapeutic decision making.

International Diabetes Federation

Recommendations for SMBG Use in Non-Insulin Treated Diabetes

The purpose(s) for performing SMBG and using SMBG data should be **agreed** between the person with diabetes and the healthcare provider.

These agreed upon purposes/goals and actual review of SMBG data should be documented.

SMBG use requires an easy procedure for patients to regularly monitor the performance and accuracy of their glucose meter.

International Diabetes Federation

SMBG Recommendation People with type 1 diabetes-NICE

All patients with type 1 diabetes must test four times daily. However, the following patients may need to test more frequently (up to 10 times daily):

- Undergoing treatment / lifestyle changes or
- Experiencing an inter-current illness or
- Using insulin pumps or
- During pregnancy or planning a pregnancy or
- Before, during and after sport or
- Increased frequency of hypoglycaemia or potential unawareness or
- There is a legal requirement to do so (such as driving, in line with the DVLA)

NICE Guideline [NG17] Type 1 diabetes in adults: diagnosis and management. August 2015.
https://www.nice.org.uk/guidance/ng17

SMBG Recommendation People with type 2 diabetes-NICE

- The person is on insulin or
- There is evidence of hypoglycaemic episodes or
- The person is on oral medication* that may increase their risk of hypoglycaemia while driving or operating machinery or
- The person is pregnant, or is planning to become pregnant or
- Poor glycemic control or
- Raised or low HbA1c

NICE Guideline [NG28] Type 2 diabetes in adults: management https://www.nice.org.uk/guidance/ng28

Appendix 1: Recommended regimes for self-monitoring of blood glucose (SMBG) in people with diabetes

Diabetes Type	Treatment Group	Monitoring Regime A management plan should be developed and agreed with the individual	Usual Blood Glucose Strip Requirement	
			Initiation	Repeat prescription
Type 1 diabetes	All people with type 1 diabetes	• SMBG is an integral part of treating type 1 diabetes. • Patients should be educated on SMBG and adjust treatment accordingly. • All patients with type 1 diabetes should monitor their blood glucose levels 4 times a day. Some patients with type 1 diabetes may need to test up to 10 times a day if any of the following apply: o Desired target for blood glucose control, measured by HbA1c level, is not achieved o Frequency of hypoglycaemic episodes increases o There is a legal requirement to do so (such as driving, in line with the DVLA) o During periods of illness o Before, during and after sport o When planning pregnancy, during pregnancy and while breastfeeding. See NICE Guideline on Diabetes in Pregnancy https://www.nice.org.uk/guidance/ng3 o If there is a need to know blood glucose levels more than 4 times a day for other reasons[1].	100 strips (2 boxes; pack size 50)	Minimum 2 to 3 boxes (pack size 50) each month. But may need more; up to a maximum of 6 boxes (pack size of 50) per month.
Intensive management or loss of hypoglycaemic awareness	Frequent testing is essential in insulin pump therapy users, those unwell, or carbohydrate counting	A management plan should be developed and agreed with the individual • Up to 8 or more tests daily	250 strips (5 boxes; pack size 50)	4 to 5 boxes (pack size 50) every Month [but may need less]
Pre-pregnancy, pregnancy in type 1 & type 2 & gestational diabetes	All women with diabetes who are planning a pregnancy, pregnant women with diabetes and gestational diabetes	All should perform SMBG at least 4 times a day (in some cases up to 8 times a day), to include both fasting and post prandial blood glucose measurements[5]. See NICE Guideline on Diabetes in Pregnancy https://www.nice.org.uk/guidance/ng3 for specific monitoring required for individual patient circumstances. *Pregnant women with type 1 diabetes may experience frequent hypos (especially at the start of pregnancy) and so may need to perform additional SMBG.	150 strips (3 boxes; pack size 50) for the first month	Minimum of 2 to 3 boxes per month (pack size 50). Maximum of 5 boxes per month (pack size 50) *but may need more.
Type 2 diabetes	Insulin therapy, or hypoglycaemic episodes or taking a sulfonylurea or glinide	Consider self- monitoring frequency of 2 - 4 times daily. This may be reduced to once daily or less if glycaemic control is considered to be stable, in agreement with the patient. Testing frequency may increase in some circumstances e.g. • During periods of illness, instability, or use of corticosteroids. • There is a legal requirement to do so (such as driving, in line with the DVLA) • Any significant lifestyle changes. Assess patients' understanding and use of results to adjust diet, lifestyle and treatment.	100 strips; 2 boxes (pack size 50)	1 to 3 boxes per month (pack size 50) depending on number of tests required per day
	Diet and physical activity alone. Metformin alone. Combination therapies which do not include sulfonylureas or insulin.	Glycaemic control can be monitored through HBA1c to agreed individual targets. Patients should not routinely need to perform self- glucose monitoring. **Short term SMBG** (with review) may be appropriate in some circumstances, e.g. • To assess changes in glucose control resulting from medication and lifestyle changes or when newly diagnosed (if considered appropriate by the patient's healthcare professional, and as part of clinical plan) • When starting treatment with oral or intravenous corticosteroids • During acute inter current illness • To confirm suspected hypoglycaemia	50 strips (1 pack) to facilitate monitoring agreed	No repeat. Issue 50 strips (1 box of 50) on request, ONLY where appropriate

-Swale Clinical Commissioning group/Medway Clinical Commissioning Group: Guidelines on self-monitoring of Blood Glucose (SMBG) in Adults with Diabetes. (Published February 2016)
-NICE guideline [NG3] Diabetes in Pregnancy management from preconception to the postnatal period. August 2015. https://www.nice.org.uk/guidance/ng3

Self-Monitoring of Blood Glucose (SMBG)- Diabetes Canada

A. REGULAR SMBG IS REQUIRED if the person with diabetes is:

SITUATION	SMBG RECOMMENDATION
Using multiple daily injections of insulin (≥ 4 times per day)	SMBG ≥ 4 times per day (see page 2 - QID - [basal-bolus/MDI])
Using an insulin pump	
Using insulin < 4 times per day	SMBG at least as often as insulin is being given (see page 2 - premixed or basal insulin only)
Pregnant (or planning a pregnancy), whether using insulin or not	SMBG individualized and may involve SMBG ≥ 4 times per day
Hospitalized or acutely ill	
Starting a new medication known to cause hyperglycemia (e.g. steroids)	SMBG individualized and may involve SMBG ≥ 2 times per day
Experiencing an illness known to cause hyperglycemia (e.g. infection)	

DIABETES CANADA

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Self-Monitoring of Blood Glucose (SMBG)- Diabetes Canada

B. INCREASED FREQUENCY OF SMBG MAY BE REQUIRED if the person with diabetes is:

SITUATION	SMBG RECOMMENDATION
Using drugs known to cause hypoglycemia (e.g. sulfonylureas, meglitinides)	SMBG at times when symptoms of hypoglycemia occur or at times when hypoglycemia has previously occurred
Has an occupation that requires strict avoidance of hypoglycemia	SMBG as often as is required by employer
Not meeting glycemic targets	SMBG ≥ 2 times per day, to assist in lifestyle and/or medication changes until such time as glycemic targets are met
Newly diagnosed with diabetes (< 6 months)	SMBG ≥ 1 time per day (at different times of day) to learn the effects of various meals, exercise and/or medications on blood glucose
Treated with lifestyle and oral agents AND is meeting glycemic targets	Some people with diabetes might benefit from very infrequent checking (SMBG once or twice per week) to ensure that glycemic targets are being met between A1C tests

DIABETES CANADA

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Diabetes technology

The term used to describe the **hardware**, **devices**, and **software** that people with diabetes use to help manage blood glucose levels, stave off diabetes complications, reduce the burden of living with diabetes, and improve quality of life.

Use of technology should be individualized based on a patient's needs, desires, skill level, and availability of devices.

Diabetes technology

- ✓ **Technology for Insulin delivery:** smart pens, pump

- ✓ **Technology for blood glucose monitoring :** meter or continuous glucose monitor
  - BGM
  - CGM
  - FGM
- ✓ **Hybrid devices that both monitor glucose and deliver insulin :** Closed-Loop Systems

- ✓ **Technology to help you manage your diabetes :**

software that serves as a medical device, providing diabetes self-management support

like carb counting apps

Summary

- Purposes of SMBG:
  - Enhance the understanding of diabetes as part of their education
  - Facilitate/enhance healthy behaviors
  - Facilitate timely treatment initiation and titration optimization

- SMBG should be used only when patients and providers have the knowledge, skills and willingness to incorporate SMBG monitoring and therapy adjustment into their diabetes care plan

- SMBG protocols (intensity and frequency) should be individualized to address each individual's specific educational/behavioral/clinical requirements