



# Establishing Expert, Multi-Disciplinary, Peer-Reviewed Consensus to Lead a Paradigm Shift in Optimal Blood Glucose Management

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## ABSTRACT

**Introduction:** The National Health Service (NHS) in the UK appears unclear on how blood glucose monitoring (BGM) should be used to support diabetes patient care and empowerment, and local interpretation of NICE guidance on the availability of devices varies widely. An expert group of clinicians and

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commissioners considered BGM in terms of access, guidance, resources, data integration, patient education, and patient choice.

**Methods:** The group generated a series of questions on BGM into a 38-statement questionnaire using Delphi methodology. This was circulated to clinicians involved in diabetes management across the UK, receiving 222 responses.

**Results:** From the questionnaire, 35 of the 38 statement responses showed > 66% consensus, with 26 of these achieving > 90% agreement.

**Conclusion:** The expert group reviewed the responses and made recommendations based on the clear professional consensus demonstrated. These included the need to use new technology and data integration and that wider factors, including patient choice rather than cost alone, should inform formulary inclusion of BGM equipment.

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**Keywords:** BGM; Blood glucose; Glycemic control; Consensus; Monitoring; Type 1 diabetes; Type 2 diabetes

## INTRODUCTION

Diabetes is a widely prevalent long-term condition in which raised blood glucose levels over time contribute to complications that are costly in terms of healthcare use and impact adversely

on quality of life. Blood glucose monitoring (BGM) has an important part to play in the management of blood glucose in diabetes and the reduction of risk of serious secondary complications [1]. The first BGM meter was introduced in 1970 [1], and available technology has evolved markedly since then. In today's technology-rich environment, self-monitoring of blood glucose is an integral part of effective diabetes management [2], allowing patients to monitor their glycemic status and adjust their therapy accordingly.

Modern healthcare requires that long-term conditions are managed in a shared and collaborative way between the patient and all stakeholders involved in their care, rather than solely by the patient or healthcare professionals (HCPs). Despite clear demonstrations of the benefits of BGM meters that provide feedback to patients [2], and diabetes being almost universally managed in the UK by NHS professionals, there is an apparent lack of clarity within the NHS regarding emerging BGM technologies and their potential to positively impact service delivery and increase resource efficiency while supporting patient empowerment. This was demonstrated in a survey of over 1000 BGM users carried out by Diabetes UK [3], with the responses suggesting that NICE (National Institute for Health and Care Excellence) guidance is not always implemented as recommended for type 1 [4] and type 2 [5] diabetes.

This consensus steering group (all members are co-authors to this paper) has sought the real-life perspectives of NHS staff involved in diabetes care to gain an understanding of their attitudes to BGM technology and its value for people with diabetes who require intensive BG monitoring. This was felt necessary because the speed of introduction of technology was perceived to move more quickly even than centralized expert guidance. In order to fulfil the requirements for fully collaborative shared care, it is important that optimum technology is utilized and a 'big data' approach is adopted, in order to increase resource efficiency.

## METHODS

This article does not contain any studies with human participants or animals performed by any of the authors.

The group used the Delphi [6] methodology to validate the views of a large number of peers regarding BGM in the current UK National Health Service (NHS) setting, with the goal of better understanding their views regarding changing demographics and BGM technology. The recommendations derived from the responses seek to support HCPs in assessing new technologies available to them and provide decision-support for choice of technology. As such, these consensus views and recommendations which the group felt were justifiable from the responses are offered in order to provide a reference point for the use of BGM for both commissioners and providers. In addition, the consensus process aimed to identify regional variation in the responses to statements and is intended to inform the paradigm shift required to adopt new technologies for BGM.

A group of clinicians and payers involved in diabetes care met to review the current adoption of BGM systems in the UK and determine a framework for consensus. Seven key topics were initially identified, and consensus statements developed for each (Table 1). These statements were collated into a questionnaire, which was circulated widely over a 3-month period to clinicians involved in diabetes management by in-person cascade and by e-mail from group members and with the help of LifeScan, Inc. (London, UK) representatives. Responses were collated and analyzed in confidence by Triducive Ltd (St Albans, UK). Respondents were required to use a 4-point Likert scale to rate their agreement with each statement. Responses were: 'strongly disagree'; 'tend to disagree'; 'tend to agree'; and 'strongly agree.' The questionnaire also asked respondents for their locality, their speciality, and the department in which they work. While personal details were not used for reporting results, clinical background and locality were used to assess potential differences in responses between professions and across the UK.

**Table 1** Consensus topics and statements

Consensus statement number	Consensus topic	Statement
1	Evidence and outcomes	The willingness of the patient to engage with a particular BGM device should be the driving factor in choice
2		Evidence should determine choices relating to BGM
3		There is a lack of evidence that more expensive BGM meters improve outcomes in type 1 diabetes and people with diabetes using insulin
4		Patient preference may be more important than evidence alone in choosing an appropriate BGM system in select patient groups
5		HCP preference is more important than evidence alone in choosing an appropriate BGM system in select patient groups
6		Evidence for blood glucose monitoring should include patient reported outcome measures
7		Evidence supporting the real-world usability of a device should be provided by the manufacturers
8	Access to blood glucose monitoring data	Consistency and reproducibility of data is important for decision-support
9		BGM data should always support treatment decisions for people with type 1 diabetes or patients using insulin
10		It is important that the user can access real-time reports of their personal BGM data, trends, and patterns
11		Patients should be able to readily share their data with partners and medical professionals in real time
12	Influencing guidance	Decision-makers should consider real-world evidence when making recommendations
13		Guidance should include clear, evidence-based decision support that is accessible to all HCPs
14		Guidance should support the value of digital solutions (e.g., real-time data sharing, remote consultations) in formulary selection
15		It is important that patients have access to real-time feedback/reports of their BGM trends and patterns to enable them to act

Table 1 continued

Consensus statement number	Consensus topic	Statement
16	Use of resources	BGM manufacturers should provide data to indicate that their products fall below the NICE £30,000 per QALY threshold
17		Guidance around SMBG is misinterpreted and confusing to HCPs in terms of managing patients with type 1 diabetes or patients using insulin
18		Flash glucose monitoring has the potential to improve the use of NHS resources by supporting SMBG
19		Effective BGM (understanding and action) reduces the risks of hypoglycemia and ketoacidosis in patients with type 1 diabetes
20		The NHS should consider innovation in BGM for patients with type 1 diabetes or patients using insulin as an investment, rather than a cost
21	Patient education	Decision-making through effective BGM (understanding and action) is a necessary component of patient education
22		HCPs and carers need a common understanding of how to interpret and act upon BGM data, trends and patterns
23		It is important that patients learn how to analyze and act upon trends and patterns in their SMBG/BGM data
24		Access to and action based on BGM data will improve patient motivation to adhere to their optimal SMBG regimen
25		Patient education can be effectively delivered at home through virtual consultations and virtual data sharing using digital applications
26		Decision-making based on frequent and effective SMBG (BGM) is a necessary component of supporting effective patient education
27		Resources could be saved by replacing face-to-face structured education with education delivered virtually using new digital/BGM solutions
28		Effective BGM (with appropriate tools/features) provide a means to offer positive reinforcement to better support patient decisions

**Table 1** continued

Consensus statement number	Consensus topic	Statement
29	Data integration	Patients' BGM data should be easily accessible by every HCP involved in their care (to whom they have consented to provide access)
30		NHS data systems are not capable of effectively sharing data
31		Data should be accessible and integrated irrespective of the device that the patient uses
32		A standardized approach to cloud-held data and its formatting will improve its accessibility and utility for patients and HCPs
33	Patient choice	BGM systems should not present barriers to regular use by patients
34		Formulary availability of BGM systems should not be driven by acquisition cost alone
35		The NHS should allow patient co-payment in order to allow more individualized patient care
36		Choice of BGM system should support the achievement of the patient's own goals
37		Formulary availability of BGM systems should only be driven by patient choice
38		The willingness of the patient to engage with a particular BGM device should be the driving factor in choice

*BGM* Blood glucose monitoring, *HCP* healthcare professional, *NHS* UK National Health Service, *NICE* National Institute for Health and Care Excellence, *QALY* quality-adjusted life-year, *SMBG* self-monitoring of blood glucose

Completed questionnaires were then collated, and the individual scores for each statement analyzed in order to produce a full arithmetic agreement score for each statement. The responses were then sub-grouped by locality and specialty to identify variances in the respondent's agreement scores by either geography or role.

The steering group had predefined the threshold of agreement for consensus at  $\geq 66\%$ . Consensus was defined as 'high' at  $\geq 66\%$  and 'very high' at  $\geq 90\%$ .

Due to the high levels of agreement with all but three of the statements, demonstrating very strong consensus views, the group elected to avoid a further round of questionnaires to generate a larger number of responses, and instead chose to work with the responses to the original statements.

## RESULTS

Completed questionnaires were returned by 222 respondents. The questionnaires were analyzed to score the total level of agreement with each of the 38 statements. Of the 38 statements, 35 (92%) achieved an agreement score exceeding the 66% threshold, and 26 of these (68%) exceeded 90% agreement (Table 2, Fig. 1).

Only three of the statements achieved an agreement score of  $< 66\%$  or  $> 33\%$  and thus were defined as not achieving consensus (Table 3).

Respondents were analyzed by region. The number of respondents from each region is shown in Table 4. The sample was dominated by respondents from England ( $n = 136$ ) while only four respondents were from Wales. Eighteen respondents did not indicate their region.

While the majority of statements were scored similarly, irrespective of the respondent's region (Fig. 2), nine statements showed larger regional variation in score (Table 5).

Responses were also analyzed according to the respondent's role (Table 6).

While the largest single respondent groups by role were diabetologists and diabetes specialist nurses (DSNs), 39 respondents did not share their role on the questionnaire and thus

remain unknown and 19 had other roles. Comparison between the responses of diabetologists, DSNs and the group overall is shown in Fig. 3.

With the exception of statements 3, 4, 5, 16, 17, 27, 30, and 37, the views of DSNs were well aligned with those of the wider group. The variation in agreement scores for these statements according to role is shown in Table 7.

## DISCUSSION

In this paper we describe the consensus views of a large group of clinicians working the UK NHS, a government-funded, cost-limited healthcare system that is substantially free at the point of use. As such, the recommendations and views presented here may not reflect the views of HCPs in other healthcare systems.

For patients with a need to optimize their glycemic control, many factors may influence their choice of BGM system. Understanding the value of a system to a patient may be a more important measure than simply looking at the acquisition cost of that device. In light of this, sharing the acquisition cost with the patient may be a valid option, as patients have demonstrated that when a device is recognized as offering important advantages, they may be willing to contribute to the cost [7].

Effective BGM is recognized by 99.1% of respondents as having the potential to reduce hypoglycemia and ketoacidosis in patients with type 1 diabetes. Effective BGM may be regarded as achieving tight glycemic control (according to the type of diabetes) in line with personalized goals.

Respondents strongly agree with the assertion that flash glucose monitoring has the potential to improve the use of NHS resources (88.9% agreement) and should be considered as an investment rather than a cost (96.3% agreement).

### Influencing Guidance

Unsurprisingly, respondents strongly agree with statements 12 and 13 concerning the need for real-world evidence when making

**Table 2** Consensus statements and agreement scores

Consensus statement number	Topic	Statement	Agreement score (%)
1	Evidence and outcomes	The willingness of the patient to engage with a particular BGM device should be the driving factor in choice	93.7
2		Evidence should determine choices relating to blood glucose monitoring	92.7
3		There is a lack of evidence that more expensive BGM meters improve outcomes in type 1 diabetes and people with diabetes using insulin	78.5
4		Patient preference may be more important than evidence alone in choosing an appropriate BGM system in select patient groups	71.8
5		HCP preference is more important than evidence alone in choosing an appropriate BGM system in select patient groups	34.9
6		Evidence for blood glucose monitoring should include patient reported outcome measures	97.2
7		Evidence supporting the real-world usability of a device should be provided by the manufacturers	95.0
8	Access to blood glucose monitoring data	Consistency and reproducibility of data is important for decision support	99.1
9		BGM data should always support treatment decisions for people with type 1 diabetes or patients using insulin	98.2
10		It is important that the user can access real time reports of their personal BGM data, trends and patterns	94.5
11		Patients should be able to readily share their data with partners and medical professionals in real time	96.8
12	Influencing guidance	Decision-makers should consider real world evidence when making recommendations	98.6
13		Guidance should include clear, evidence-based decision support that is accessible to all HCPs	97.7
14		Guidance should support the value of digital solutions (e.g. real time data sharing, remote consultations) in formulary selection	98.2
15		It is important that patients have access to real time feedback/ reports of their BGM trends and patterns to enable them to take action	96.8

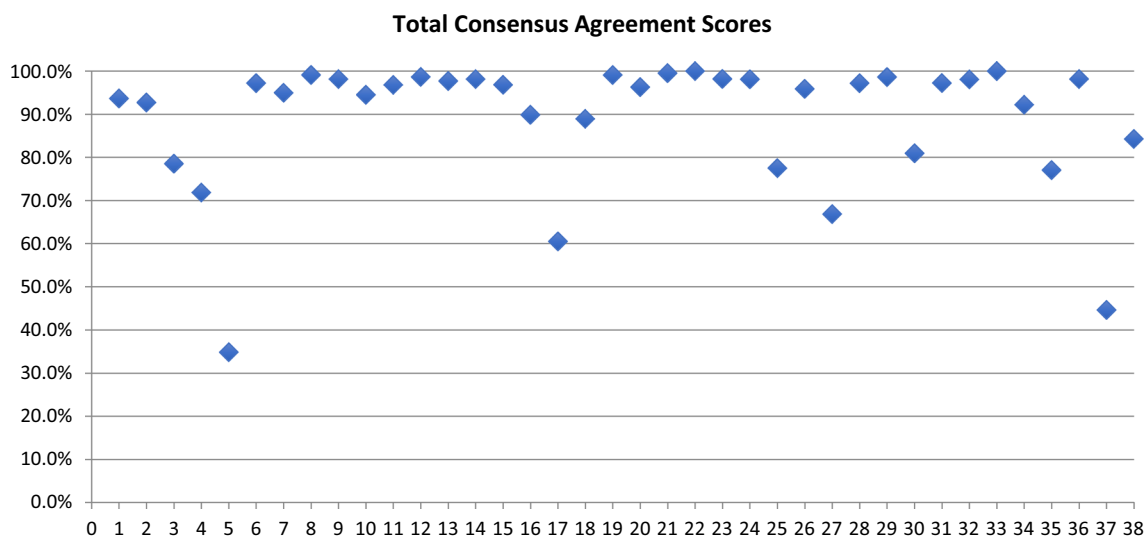
**Table 2** continued

<b>Consensus statement number</b>	<b>Topic</b>	<b>Statement</b>	<b>Agreement score (%)</b>
16	Use of resources	BGM manufacturers should provide data to indicate that their products fall below the NICE £30,000 per QALY threshold	89.9
17		Guidance around SMBG is misinterpreted and confusing to HCPS in terms of managing patients with type 1 diabetes or patients using insulin	60.5
18		Flash glucose monitoring has the potential to improve the use of NHS resources by supporting SMBG	88.9
19		Effective BGM (understanding and action) reduces the risks of hypoglycemia and ketoacidosis in patients with type 1 diabetes	99.1
20		The NHS should consider innovation in BGM for patients with type 1 diabetes or patients using insulin as an investment, rather than a cost	96.3
21	Patient education	Decision making through effective BGM (understanding and action) is a necessary component of patient education	99.5
22		HCPs and carers need a common understanding of how to interpret and act upon BGM data, trends and patterns	100.0
23		It is important that patients learn how to analyze and act upon trends and patterns in their SMBG/BGM data	98.2
24		Access to and action based on BGM data will improve patient motivation to adhere to their optimal SMBG regimen	98.1
25		Patient education can be effectively delivered at home through virtual consultations and virtual data sharing using digital applications	77.5
26		Decision making based on frequent and effective SMBG (BGM) is a necessary component of supporting effective patient education	95.9
27		Resources could be saved by replacing face-to-face structured education with education delivered virtually using new digital/BGM solutions	66.8
28		Effective BGMs (with appropriate tools/features) provide a means to offer positive reinforcement to better support patient decisions	97.2



**Table 2** continued

Consensus statement number	Topic	Statement	Agreement score (%)
29	Data integration	Patients’ BGM data should be easily accessible by every HCP involved in their care (to whom they have consented to provide access)	98.6
30		NHS data systems are not capable of sharing data effectively	81.0
31		Data should be accessible and integrated irrespective of the device that the patient uses	97.2
32		A standardized approach to cloud-held data and its formatting will improve its accessibility and utility for patients and HCPs	98.1
33	Patient choice	BGM systems should not present barriers to regular use by patients	100.0
34		Formulary availability of BGM systems should not be driven by acquisition cost alone	92.2
35		The NHS should allow patient co-payment in order to allow more individualised patient care	77.0
36		Choice of BGM system should support the achievement of the patient’s own goals	98.2
37		Formulary availability of BGM systems should only be driven by patient choice	44.7
38		The willingness of the patient to engage with a particular BGM device should be the driving factor in choice	84.3



**Fig. 1** Plot of total consensus agreement scores

**Table 3** Statements with agreement scores of between 33 and 66%

Consensus statement number	Topic	Statement	Agreement score (%)
5	Evidence and outcomes	HCP preference is more important than evidence alone in choosing an appropriate BGM system in select patient groups	34.9
17	Use of resources	Guidance around SMBG is misinterpreted and confusing to HCPS in terms of managing patients with type 1 diabetes or patients using insulin	60.5
37	Patient choice	Formulary availability of BGM systems should only be driven by patient choice	44.7

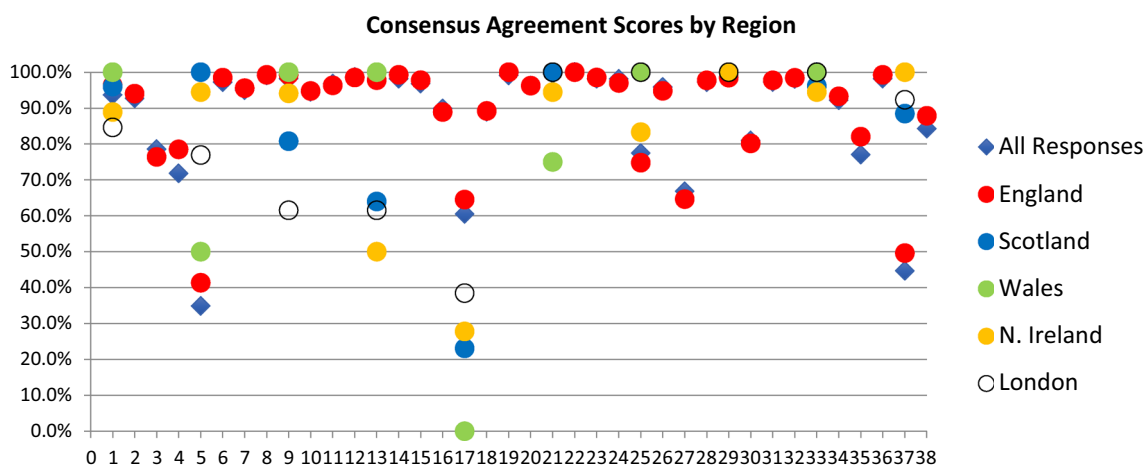
**Table 4** Respondents by region

Region	Number of respondents
England	136
Scotland	26
Wales	4
Northern Ireland	18
London	13
Unknown	25
Total	222

recommendations and the need for clarity in the evidence base from guidance used in decision-support. There is strong agreement (98.2%)

endorsing the need for digital solutions, which may support the objective of increasing personal management of long-term conditions. In addition, 96.8% of respondents agree that patients should have access to real-time data enabling them to act.

In total, 98.2% of delegates support the view that guidance should support the value of digital solutions when it comes to formulary inclusion. However, BGM formulary decisions are still firmly focused on devices and the acquisition cost of the device test strips, despite the NHS’s intention to move to solutions that are orientated around digital, big data and evidence that demonstrates an impact on health outcomes.



**Fig. 2** Consensus agreement scores by region

**Table 5** Statements with largest regional variation in agreement scores

Consensus statement number	Topic	Statement	Agreement scores (%)				
			England (%)	Scotland (%)	Wales (%)	Northern Ireland (%)	London (%)
2	Evidence and outcomes	Evidence should determine choices relating to BGM	94.0	100.0	50.0	94.4	76.9
3		There is a lack of evidence that more expensive BGM meters improve outcomes in type 1 diabetes and people with diabetes using insulin	76.4	80.8	100.0	94.1	61.5
4		Patient preference may be more important than evidence alone in choosing an appropriate BGM system in select patient groups	78.5	64.0	100.0	50.0	61.5
5		HCP preference is more important than evidence alone in choosing an appropriate BGM system in select patient groups	41.4	23.1	0.0	27.8	38.5
16	Use of resources	BGM manufacturers should provide data to indicate that their products fall below the NICE £30,000 per QALY threshold	88.9	92.3	75.0	100.0	84.6
17		Guidance around SMBG is misinterpreted and confusing to HCPS in terms of managing patients with type 1 diabetes or patients using insulin	64.5	61.5	25.0	42.9	46.2
25	Patient education	Patient education can be effectively delivered at home through virtual consultations and virtual data sharing using digital applications	74.8	73.1	100	76.5	76.9
35	Patient choice	The NHS should allow patient co-payment in order to allow more individualised patient care	82.0	65.4	50.0	72.2	75.0
38		The willingness of the patient to engage with a particular BGM device should be the driving factor in choice	87.9	84.6	100.0	70.6	38.5

**Table 6** Respondents by role

Role	N
Diabetologist	53
Diabetes specialist nurse	45
Pharmacist	22
Nurse	20
GP	13
Obstetrics	8
Dietician	3
Other	19
Unknown	39
Total	222

### Access to BGM Data

All statements relating to BGM data are very strongly supported by respondents. Having consistency and reproducibility of data is considered to be of paramount importance (99.1%), and supporting type 1 patient's treatment decisions in real-time is strongly supported (98.2%).

The need for patients to have real-time reports of their personal BGM data is supported by 94.5% of respondents. It has been shown that automated pattern algorithms can assist in the avoidance of hypoglycemic episodes [8, 9].

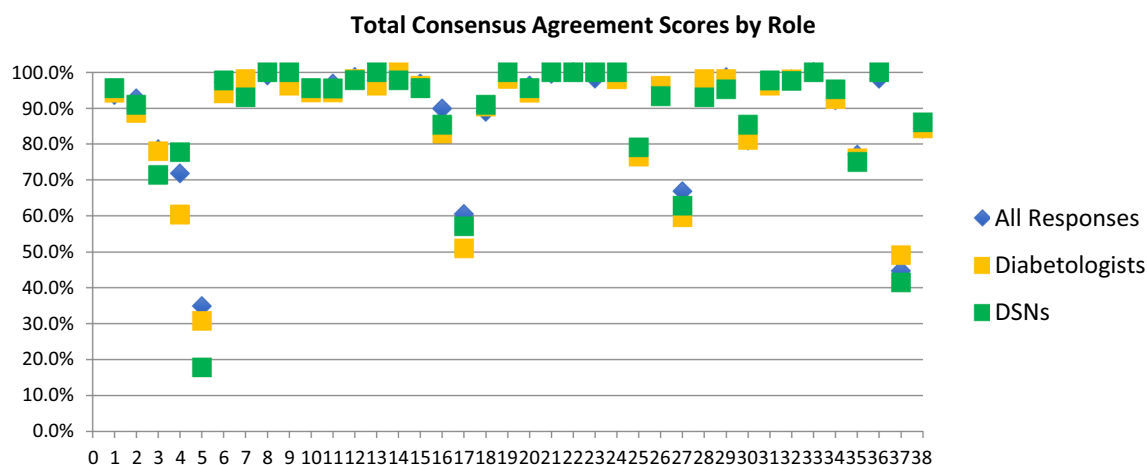
it has been reported that 32.3% of measured hypoglycemic episodes are preceded by an observed pattern of low blood glucose [10]. Data should always support treatment decisions for people with type 1 diabetes or patients using insulin (96.8%).

Data offer patients the insight to manage their blood glucose with confidence. Respondents strongly agree that decisions made by patients should always be supported by data (98.2%). Access to data promotes engagement with trends and patterns within the data to inform the patient in a way that complements the role of the HCP.

### Patient Education

There is evidence to show that good BGM results in better outcomes and that people should be supported and educated in the interpretation of data to achieve these better outcomes. In our survey 100% of respondents support the importance of a common understanding of how to interpret and act upon BGM data, trends, and patterns. Given the nature of diabetes, it is vital that carers are actively involved with patients, and access to real-time data is an important consideration. Diabetes impacts the whole household [11].

Among respondents, 99.5% agree that effective BGM is a necessary component of patient education; in addition, the importance of access

**Fig. 3** Consensus agreement scores by role. *DSN* Diabetes specialist nurse

**Table 7** Statements with largest variation in agreement scores by role

Consensus statement number	Topic	Statement	Agreement scores (%)		
			Total (%)	DSNs (%)	Diabetologists (%)
3	Evidence and outcomes	There is a lack of evidence that more expensive BGM meters improve outcomes in type 1 diabetes and people with diabetes using insulin	78.5	71.4	78.0
4		Patient preference may be more important than evidence alone in choosing an appropriate BGM system in select patient groups	71.8	77.8	60.4
5		HCP preference is more important than evidence alone in choosing an appropriate BGM system in select patient groups	34.9	17.8	30.8
17	Use of resources	Guidance around SMBG is misinterpreted and confusing to HCPS in terms of managing patients with type 1 diabetes or patients using insulin	60.5	57.1	51.0
27	Patient education	Resources could be saved by replacing face-to-face structured education with education delivered virtually using new digital/BGM solutions	66.8	62.8	59.6
30	Data integration	NHS data systems are not capable of sharing data effectively	81.0	85.4	81.1
37	Patient choice	Formulary availability of BGM systems should only be driven by patient choice	44.7	41.5	49

*DSN* Diabetes specialist nurse

to BGM data and of understanding trends and patterns is strongly supported (statements 23 and 24). Access to feedback on their progress helps patients to take action to improve their diabetes control or continue with previous positive actions [2]. There is strong agreement that virtual data and applications can support education at home. Remote support in the patient's home and work environments is important so that patients are not constrained by the need to attend a clinic.

Statement 27 achieved consensus (66.8% agreement) despite the inference that resources could be saved by replacing face-to-face education. In reality, respondents may better support the assertion that the two should complement one another. This would offer a synergistic benefit. There is 97.2% agreement among respondents that BGM offers a means to offer

positive reinforcement in support of patient decisions, reflecting recent published data [2, 12].

### Data Integration

Respondents strongly support that the notion that data systems should be integrated and inter-operable across the NHS (97.2% agreement). Eventually, integration of data should involve a standardized approach in order to improve access and utility (statements 31 and 32). Data are of no use unless it can be effectively used and applied.

Members of the consensus group agreed that high-quality data are essential for constructive consultations; therefore, access to data will improve resource utilization and avoid wasted clinic sessions. There was 98.6% agreement

among respondents that patients' BGM data should be accessible by every HCP involved in their care. This result is supported in the literature, with published data showing improvement in glycemic control by patients using integrated BGM data [8, 12]. Cloud-held data may lead to better data-utility among patients and HCPs (98.1%) as long as it is easily accessible as per regulatory guidelines. It may also facilitate remote consultations and can alleviate the problem of forgotten logbooks or devices in face-to-face consultations.

Accessible cloud-held data can also be shared/socialized with caregivers (e.g., elderly patients) and loved ones (e.g., parents of children). Studies have demonstrated improvements in outcomes when data is used in this way [8].

### Use of Resources

Respondents strongly agree that manufacturers should provide quality-adjusted life-year data to support their products (89.9%). There is a need for clear and consistent guidance regarding BGM, as evidenced by the lack of clarity from respondents regarding statement 17.

Almost all respondents (99.1%) agree that effective BGM will reduce the risks of hypoglycemia and ketoacidosis in patients with type 1 diabetes. New technology has the potential to improve the use of NHS resources and should be considered as an investment rather than a cost (96.3% agreement). New technologies that facilitate effective glycemic control are strongly supported by respondents (88.9% agreement to statement 18, which is specific to flash glucose monitoring and 96.3% agreement to statement 20). Solutions with automated pattern algorithm integration can improve HCP efficiency and accuracy [13].

### Evidence and Outcomes

Respondents strongly indicate (92.7%) that evidence is important in improving patient care and that it should inform choices relating to BGM. Recent evidence [2] shows that switching patients to BGM systems featuring color range

indicators was associated with improvements in glycosylated hemoglobin levels compared to subjects using a wide selection of marketed BGM systems without color support [14]. Despite this, respondents support the assertion (78.5%) that there is a lack of evidence that more expensive BGM systems improve outcomes, suggesting that respondents may not be fully aware of recent innovations and published data. Data are available providing direct comparison between solutions that help the patient and HCP with insights and interpretation of the number versus traditional BGM [14].

While the preference of the HCP is not regarded by the respondents as being more important than evidence (34.9%), patient preference is strongly supported (71.8%) as more being important than evidence alone in choosing the right BGM system for the patient. Respondents strongly agree that evidence should include patient-reported outcome measures (PROMS) (97.2%), such as real-world usability (93.7%).

### Patient Choice

A majority of respondents concurred that formulary availability should not be driven by a single factor alone, with general agreement that neither patient choice (55.3%) nor acquisition cost (92.2%) is sufficient to effectively make formulary choices. Interestingly, respondents are accepting of patient co-payment (77%) as a means of accessing novel technology and supporting individualized patient choice. This is a paradigm shift and may reflect changing professional attitudes. However, many patients have traditionally self-funded their BGM regimen in the past, and the 2017 Diabetes UK Survey recently revealed that BGM is less available than patients' requirements [3].

There are 98.2% of respondents who agree that the choice of BGM system should support the achievement of the patients' own goals and 84.3% who agree that the willingness of the patient to engage with a particular BGM device should be the driving factor in choice of system. Recent data suggest that BGM supported by a web application and OneTouch Verio (OTV;

LifeScan Inc., Milpitas, CA, USA) meter improved blood glucose control [12]. In addition, recent studies indicate that connected BGM solutions that provide access to cloud-held data allow patients to feel more secure in the knowledge that they can access their diabetes information at any time [15].

Overall, the strong support from a large respondent group underlines the need to ensure that patients have access to appropriate BGM systems in line with the needs and expectations of their health care professionals. New BGM technologies should be regarded as an investment rather than a cost, as long-term cost-effectiveness may be achieved due to a reduction in negative outcomes and admissions and in greater patient satisfaction. This opportunity reflects the wider shift towards value-based healthcare in the NHS.

### Limitations of Study

The cascade circulation of the questionnaire from the group to their network of colleagues and the willingness of the 222 clinical professionals to respond spontaneously may have introduced bias; nevertheless, the statements produced a high level of clinical consensus in areas of uncertainty around BGM. The professionals who responded covered a wide range of disciplines and geographical spread within the UK, but despite this there was a great deal of agreement in their responses.

## CONCLUSIONS

The conclusions drawn by the consensus group after consideration of the questionnaire responses are as follows:

- Informed patient choice should be regarded as the prime factor in the effective use of a BGM system.
- Patient co-payment should be supported where appropriate as this will allow more individualized patient care and empower self-management.
- Data integration is urgently required for BGM system access.
- Real-time BGM data should be made available to patients and provide positive reinforcement.
- Guidance should be inclusive of evidence, patient preference, and outcomes data.
- Wider factors, such as patient choice, should inform guidance rather than cost alone.
- New technology for BGM should be regarded as an investment rather than a cost.
- Structured education should be complemented by access to real-time feedback data.
- The choice of BGM system should support the achievement of the patients' own goals.
- Shared ownership of the responsibility for self-care is critical.

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