

Understanding HbA1c Measurements and Reports

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There has been a change in routine laboratory HbA1c reporting from the National Glycohemoglobin Standardization Program (NGSP) percentage (%) units to International Federation of Clinical Chemists (IFCC) units millimoles per mole (mmol/mol).

This change could cause confusion or misunderstandings of diabetes management for people with diabetes and/or their health professionals.

There should be a period of dual reporting in both mmol/mol and NGSP % units. It is anticipated that from late 2014 only the IFCC units will be reported. Health professionals should promote and interpret this new international reference measurement.

Background

In 1996, the Diabetes Control and Complications Trial (DCCT) Laboratory in Missouri established the National Glycohemoglobin Standardization Program (NGSP) to calibrate and standardise most USA based commercial HbA1c manufacturers.¹ The NGSP assay (BioRex 70 HPLC) used to anchor the stabilisation process has been widely adopted by other countries including Australia. However this assay is known to be influenced by a number of factors that can affect the measured level of HbA1c.

In 1994, the IFCC formed a working group to improve the standardisation of the HbA1c measurement. The IFCC working group developed the new reference system which is not confounded by most of the interfering substances measured in previous HbA1c assays.²

As the new assay standardisation produces results which are lower than the NGSP values by approximately 15 - 30%, it has been recommended that the new IFCC HbA1c values should be expressed as SI Units which would be known as "mmol/mol" on HbA1c reports to avoid potential confusion if the same units were maintained. The conversion factors (known as the master equation) between the two units are as follows:

$$\text{IFCC unit (mmol/mol)} = 10.93 \times \text{NGSP unit (\%)} - 23.5$$

$$\text{NGSP unit (\%)} = 0.09148 \times \text{IFCC unit (mmol/mol)} + 2.152$$

Adoption of the new, standardised units of measurement

There should be staged replacement of the current NGSP HbA1c units (%) with the new standardised IFCC units. These reasons are summarised below.

1. The adoption of reporting of HbA1c in IFCC units is consistent with recommendations in the published consensus statement by the American Diabetes Association (ADA), the European Association for the study of Diabetes (EASD), the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) and the International Diabetes Federation (IDF).³
2. The adoption of reporting of HbA1c in IFCC units is consistent with the stated positions of the Royal College of Pathologists of Australasia (RCPA), Australian

Diabetes Society (ADS) and the Australasian Association of Clinical Biochemists (AACB).

3. The process of reporting the new IFCC units together with NGSP units commenced in New Zealand in August 2009 with the aim of moving to IFCC units only. It is desirable that reporting across Australasia is consistent.
4. The new IFCC-aligned values provide results which better reflect the true HbA1c concentration rather than the mixture of substances indicated by the previous values.
5. This change represents an opportunity to reduce some of the confusion that results from the numerical values of the current reporting practices, thus making it easier for health professionals to inform their patients about the significance of their results
 - The numbers for the IFCC units are numerically significantly different to the current NGSP% units (commonly 6.0 – 9.0%, IFCC 42 – 75 mmol/mol) and are therefore less likely to be confused with the numerical results for serum/capillary glucose (commonly 5.0 – 10.0 mmol/L).
 - The variations in HbA1c as reported using NGSP% units, often less than 1%, may be misinterpreted as trivial and mask the significance of the variation.

The transition period will allow people with diabetes and health professionals to familiarise themselves with the new reporting system and be able to interpret the results. However in the long term it is not desirable to maintain two reporting methods for the same assay and the NGSP% Unit reporting method should be ultimately abandoned.

The routine reporting of estimated average glucose (eAG) on laboratory reports may be used at the discretion of individual clinicians as an educational tool for people with diabetes.

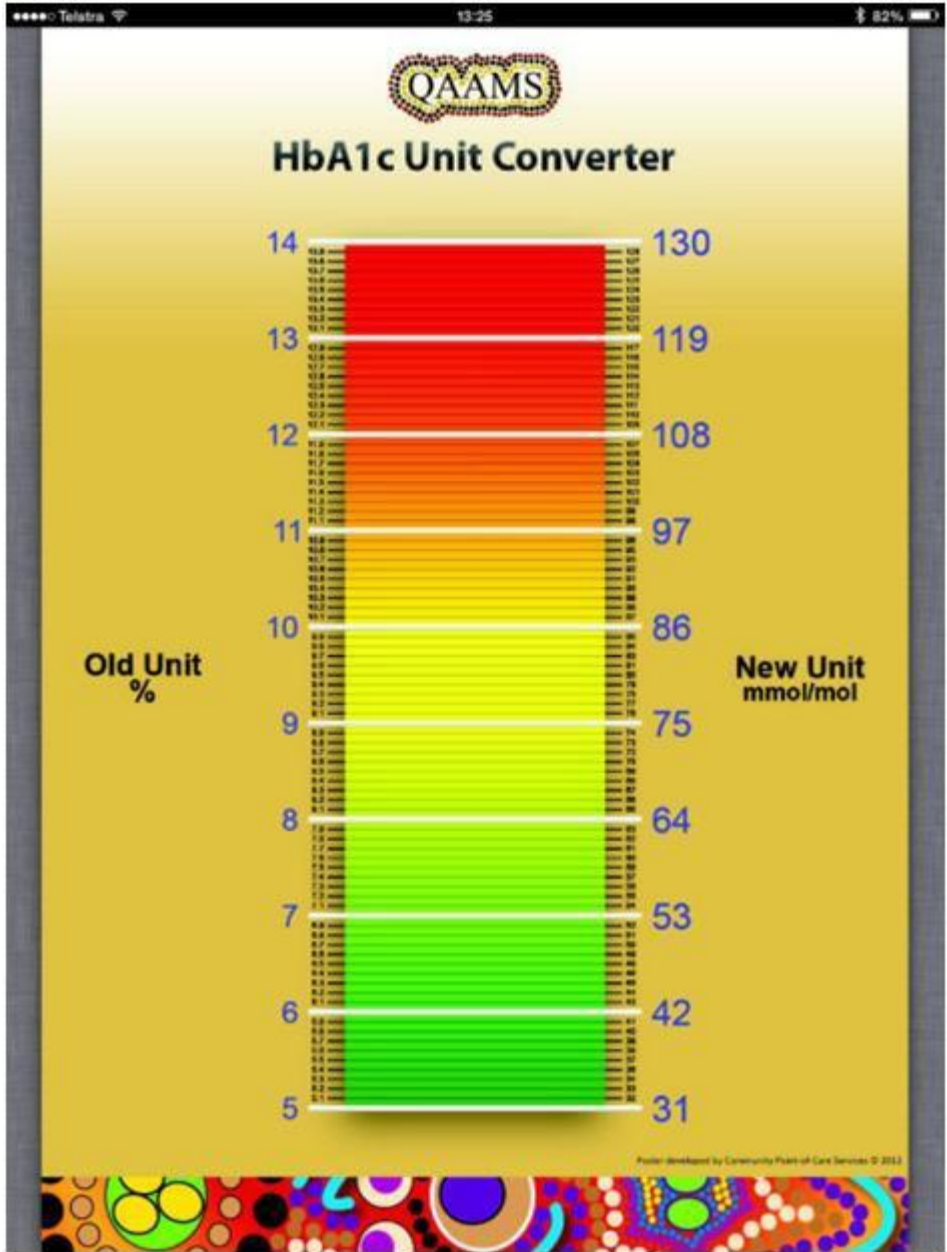
Note: Caution is needed in interpreting HbA1c test results in the presence of conditions affecting red blood cells or their survival time, such as haemoglobinopathies or anaemia.⁴

Appendix 1

HbA1c Conversion Table ⁵

HbA1c as percentage (old units)	HbA1c in mmol/mol (new units)
5.0	31
6.0	42
6.5	48
7.0	53
8.0	64
9.0	75
10.0	86
11.0	97
12.0	108

Appendix 2



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<http://www.qaams.org.au/program.htm>

References

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5. Jones GRD, Barker G, Goodall I, Schneider HG, Shephard MDS & Twigg S.M. '*Change of HbA1c reporting to the new SI units*', *Medical Journal of Australia*, 2011;195(1): 45-6.