With each new tool the insurance industry obtains to evaluate both states of health and states of disease, the temptation exists to use it in as many contexts as possible. The initial understanding in the mid-1960's that diabetic individuals have different percentages of specific hemoglobins has led to the study and refinement of the hemoglobin Alc (HbAlc), which is being used increasingly by clinicians in assessing diabetic control and by insurance to screen for diabetes mellitus. The experience and understanding we have gained using glycosylated hemoglobin, however, has quite naturally pointed up specific limitations in its use.

Diabetes mellitus presents an increasing impact not only on individual health but also on the nation's health care system in general. It is estimated that between five and six million people in the United States have diagnosed diabetes, and speculation exists that an equal number may exist undiagnosed. Diabetes is associated with a series of late complications involving blood vessels, kidneys, eyes, and the nervous system. It is likewise a leading cause of adult blindness and a major cause of myocardial infarction, stroke, gangrene, and renal failure. The need for the insurance industry to assess this major risk is obvious. The increasing realization that the presence of diabetes may accentuate other known impairments is also a topic of major concern.

Criteria for screening for the diagnosis of diabetes both by fasting glucose and post glucose load values is remarkably constant from study to study. Because of the relative cost, inconvenience and need for timed samples by insurance applicants, the industry has been increasingly focusing on the use of hemoglobin A1c (HbA1c), which is being used increasingly by clinicians in assessing diabetic control and by insurance to screen for diabetes mellitus. The experience and understanding we have gained using glycosylated hemoglobin, however, has quite naturally pointed up specific limitations in its use.

Benefits

The most obvious benefit of HbA1c is that it would seem to correlate best with the degree of diabetic control obtained over the previous several months. Because of the approximate 120 day life span of the red blood cell and the mostly irreversible glycosylation hemoglobin reaction, HbA1c appears to be a stable record of glycemic status. Tight control for several days in order to present a normal blood sugar for a single fasting determination could be more easily discovered and more appropriately underwritten. In a known diabetic, a single higher glucose reading might be more readily compensated for by the presence of a lower hemoglobin A1c value.

The glycosylated hemoglobin is an easier test for the insurance applicant as well. Because of its correlation with blood sugars 6-10 weeks previously, it can be performed at any time of the day and need not be fasting. A small blood sample is adequate. Prior dietary preparation, pretest fasting and the glucose loading required for a 2-3 hour glucose tolerance test are not needed. In addition, with proper sample handling confirmatory repetition of the test appears unnecessary.
Limitations

Measurement of glycohemoglobin is still not without problems. Samples are unstable on prolonged storage and reproducibility of some assay methods is less good than with blood glucose. The technique usually detects well-marked hyperglycemia but its sensitivity to lesser degrees is more questionable. In my own experience as an endocrinologist in clinical practice, marked variations occurred in hemoglobin A₁c in diabetics who were consistently home glucose monitoring with reproducible laboratory results to correlate their own readings. These unreported but often observed differences were with the same laboratory and sometimes with duplicate specimens submitted on the same individuals.

Glycosylation occurs throughout the existence of the individual red blood cell. If RBC survival is prolonged (e.g. after splenectomy), values will be falsely high. Oppositely, the existence of any condition that shortens RBC survival (hemolytic anemia, bleeding) will show a falsely low result.

Another problem arises with laboratory variations on hemoglobin A₁c reporting, particularly from different labs. Recalling that HbA₁a and HbA₁b are also glycohemoglobins, many laboratories find measurement of total glycosylated hemoglobin easier to perform rather than just the A₁c component. As long as individual laboratory normal ranges are included comparison is easily accomplished. When reported on an Attending Physician Statement (APS) without reference values or on physician records where the particular lab normal range is unknown, confusion in proper assessment may arise.

Impaired Glucose Tolerance (IGT)

Mortality studies have indicated that a significant difference in life expectancy exists between well controlled and uncontrolled diabetics. In medical underwriting the presence of overt diabetes mellitus is never straightforward in regards to an entirely accurate measure of future mortality but can be reasonably assessed. Impaired glucose tolerance is often a forerunner of diabetes mellitus and reports suggest that while glycosylated hemoglobin is often raised in established diabetics, it is not as sensitive as the glucose tolerance test in detecting new diabetes mellitus, and in fact very insensitive to picking up impaired glucose tolerance. IGT in itself seems unlikely to produce any marked changes in mortality, but it may have significance when coexisting with other disease states or when it is discovered at a young age, when an eventual transition to frank diabetes is more likely. In the insurance practice of evaluating a long-term or lifetime risk, the oft-maligned GTT may have an occasional useful circumstance in this setting.

Summary and Conclusions

The use of glycosylated hemoglobin as an aid in underwriting has continued to grow; indeed a recent article in the Journal of Insurance Medicine leans to a more universal use in the insurance applicant population even in the face of a normal glucose. The evidence at this time however points to the contrary.

Current insurance practice is to obtain HbA₁c when a random or fasting glucose points to a diagnosis of diabetes. The additional information the test gives adds to our assessment of diabetic control and allows us to put this value in a sharper context. This is still worthwhile and helpful to risk assessment.

The major consideration in the use of HbA₁c (and likewise any laboratory test in insurance medicine) must be the magnitude of assistance provided by the test in each case versus its cost and reliability. As a screen for the general applicant population, the test is currently far too costly to justify the mild early diabetes that would be detected in only a fraction of cases. In those instances our risk rating would not be affected nearly enough to approach the collective cost of obtaining the HbA₁c on a regular basis, and it has no routine use in this setting.

In those applicants where there is a questionable history of previous glucose intolerance or a strong family history of diabetes, HbA₁c is a poor screen and an even poorer predictor of impending diabetes mellitus because it is often too far behind in following the diagnosis. The GTT here might be a better screen, but only with the understanding that knowledge of suspected prediabetes would significantly influence an insured's rating. Glycosylated hemoglobin is likewise neither a cost effective nor appropriate screening test in this situation.

In the individual with diabetes mellitus, HbA₁c in addition to a fasting glucose is helpful in assessing control and potential risk. HbA₁c is a good protection against the isolated normal glucose in the face of poor control, and confirmatory to poor control with elevated values. Occasionally, it indicates control is better than a random sugar may show us. Glycosylated hemoglobin should be drawn in this setting.

Diabetes mellitus is certainly a complex disease and its inroads into life expectancy and overall morbidity is well appreciated. Its added effect when coexisting with other illnesses is an ongoing source of study in our industry. Hemoglobin A₁c is a good measure of degree of diabetic control and is a welcome addition to our arsenal for risk assessment. Its use as a universal screen is significantly more limited, however, and should at present be used on a much more individual basis.
References


