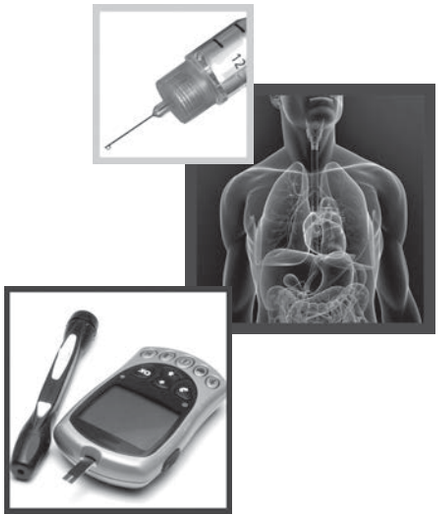
EDITORIAL

Personalized and prioritized diabetes treatment recommendations to reduce cardiovascular risk



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"A recent study from Denmark that followed all diabetes patients in that nation over a 14-year period of time recorded 47 cardiovascular deaths for every one renal death in diabetes patients."

Widespread use of electronic medical records (EMRs) makes personalized assessments of the potential benefit of various potential treatment decisions possible. Personalization can be carried out in at least three ways: personalized treatment goals based on age, comorbid conditions and risks of aggressive treatment; personalized treatment suggestions based on current treatment, comorbidities, allergies and other factors; and prioritization of multiple evidence-based treatment recommendations based on potential benefits to patients.

How to quantify cardiovascular risk

A recent study from Denmark that followed all diabetes patients in that nation over a 14-year period of time recorded 47 cardiovascular (CV) deaths for every one renal death in diabetes patients [1]. Other data also demonstrate that the main cause of excess mortality and excess healthcare costs related to diabetes complications is major CV events, primarily myocardial infarction and stroke [2]. We have all seen the terrible toll that end-stage renal failure, amputations and blindness take on quality of life; but it is the CV complications of diabetes that end lives early and account for the lion's share of lost years of life in those with diabetes.

Thus, it is of great importance for clinicians who care for adult diabetes patients to carefully monitor and manage each patient's CV risk (CVR). We have always done this in an intuitive way, but recent data indicate that intuitive assessments of CVR are often wrong. We overestimate risk for some patients, and seriously underestimate risk for other patients. A more reliable way to assess CVR in those with diabetes is to use a risk score, such as the UK Prospective Diabetes Study (UKPDS) risk engine, the Framingham Risk Score (FRS), or the newly released American College of Cardiology/American Heart Association (ACC/AHA) risk score [3–5].

There has been considerable controversy recently about the advantages and limitations of using these risk scores. It is clear that none of these risk scores are perfect. All of them draw on data from the 1990s and before, and they tend to overestimate risk of CV events and CV death. Our patients have lower than predicted rates of CV events and CV death in part owing to better in-hospital care at the time of major CV events, and improved rates of blood pressure (BP) and glucose control, more statin and aspirin use, and lower rates of tobacco use [6]. Other limitations of current CVR scores are the lack of assessment

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of glycated hemoglobin values in all except the UKPDS risk score, failure to include physical inactivity and unhealthy diet as risk factors, and the fact that most of these risk scores were developed on predominantly white populations. There is another big issue to consider – risk scores are based on the experiences of large groups of people, and no matter how scientifically valid a risk score is, it will not necessarily predict what will happen to one particular patient.

Despite these limitations, we argue that using a CV risk score ought to be a key element in routine diabetes care. Even an imperfect estimate of CV risk using a risk score is far more accurate than our casual, intuitive assessments of CV risk. Moreover, even if a risk score overestimates CV risk, using it repeatedly over time with one patient will quantify trends in CV risk over time, and this information may be very useful to both the patient and to the provider of care. Moreover, as we discuss below, risk scores such as the UKPDS, FRS or ACC/AHA risk score can be used to prioritize the potential benefits a given patient may achieve from each of several available treatment options at the time of a clinical encounter. The ability to prioritize available treatment options based on the benefit of each treatment option to the patient is a powerful tool that can be used to inform both patient and provider of treatment preferences.

Using risk scores to prioritize available treatment options

Each of the available CV risk scores can be partitioned into two components of risk. The first component of CV risk is 'not reversible', because it is due to age or sex, which cannot be manipulated to reduce CV risk. The second component of CV risk is 'potentially reversible' by pharmacologic or lifestyle treatment of CV risk components such as weight, BP, lipids, glucose, tobacco use or aspirin use. We recommend focusing clinical attention on reversible CV risk rather than total CV risk when seeing a patient. Consider an 80 year old man with diabetes who has well controlled glucose and BP, normal BMI, appropriately uses aspirin and statins, and does not smoke. This person has very high total CV risk because of his age, but essentially no reversible CV risk. There is little reason to spend time talking with this man about CV risk reduction, because there is no action that can be taken to reduce his CV risk.

Patients who have substantial reversible CV risk are the ones who need our attention and who may reap great benefits from actions to reduce CV risk. But how can we efficiently and systematically identify such patients? The simple way to do this is to calculate the patient's total CV risk using, for example, the UKPDS risk engine, and then re-run the UKPDS risk engine again, with each out-of-control risk factor now set to a value proven in randomized clinical trials to confer clinical benefit. For example, if the only out of control risk factor is a systolic BP of 156, then this is changed to 140 mmHg, and then the UKPDS equation run again. The difference between the two UKPDS risk estimates – the first run with real risk factor values, and the second run with 'normalized' risk factor values, provides an estimate of how much CV risk will be lowered if the systolic BP was lowered from 156 mmHg to 140 mmHg. This procedure is then repeated for each risk factor that may be out of control, producing an estimate for how much that patient's CV risk would be lowered by treating each of his or her out of control risk factors.

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We then compare the risk reduction that can be achieved by managing each one of the patient's out-of-control risk factors. The biggest CV risk reduction is the number one treatment priority, the next biggest risk reduction is the number 2 treatment priority and so forth. In this way, the provider and the patient can be informed, in a general way (because the risk equations are not perfect) which of several available treatment options will give the biggest benefit, in terms of reduced CV risk. This is a lot of math – but you do not have to do it. Risk scores can be programmed in web services or within EMRs to do these computations quickly and accurately, and provide you with the results just a second or two after the patient's BP is measured at a clinical encounter.

Presenting prioritized, evidence-based treatment recommendations to patients

There is considerable current controversy about the best way to present CV risk to a patient. The health literacy and numeracy of patients varies widely, and it is likely that the best way forward will be to customize the presentation of risk information based on the health literacy and

numeracy of a given patient or group of patients. For now, in the absence of evidence, we have adopted a few 'rules of the road' for conveying CV risk information to adults with diabetes or related chronic diseases: first, we prefer using symbols (such as check marks or stars) rather than numbers to rank evidence-based clinical actions from greatest to least potential benefit. Second, we do not use the word 'risk', preferring to talk about the 'danger' of a stroke or heart attack. Third, we use this tool as a way to elicit patient preferences, and indicate to the patient a small set of evidence-based clinical actions that they may want to act on. This saves a lot of time, and keeps the patient's preferences for treatments at the center of the discussion.

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So far in this discussion, we have discussed using estimates of 10-year CV risk. This is appropriate for patients who are 60 years and older, but patients who are younger may have many uncontrolled CV risk factors and still have relatively low 10-year CV risk. For patients aged 30–59 years, validated estimates of 30-year CV risk are available. For patients aged 30–59 years, 30-year CV risk estimates more accurately portray the long-term burden of CV events than does the 10-year CV risk estimate [7].

End-game of personalized medicine in primary care

In these examples, we have used EMR-based algorithms to identify and prioritize treatment options for diabetes patients based on CV risk alone. This approach can be generalized to identify and prioritize treatment options related to multiple chronic diseases or preventive care services. To prioritize across multiple clinical domains, the impact of each clinical action would need to be compared not on the basis of CV risk, but on the basis of some other metric. Other metrics to consider might be quality-adjusted life years, disability-adjusted life years or years of potential life lost before the age of 80. Using such an approach, EMR data could be used to identify which of many clinical actions 'rise to the top' in terms of potential benefit to a given patient at a given time. As the patient's clinical state evolves over time, a set of standardized algorithms (updated for advances in knowledge) would be used at each encounter to provide personalized treatment priorities that reflect the patient's evolving clinical state. As a patient develops new conditions, or as some aspects of care improve or others worsen, recommendations would keep pace, providing an evolving care plan that could be used by all members of the care team to optimize and coordinate care.

As always, the central member of the care team, and the ultimate arbiter of available treatment options remains the patient. The patient will consider these prioritized treatment recommendations along with other information to make an evidence-informed treatment decision. Although this scenario may seem somewhat futuristic, it is quite likely that such clinical decision support systems will soon be in wide use. As care providers, we can actively contribute to the evolution of this new technology, and help make sure it is designed in ways that are useful and relevant to our patients' needs.

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