A primary goal of coronary prediction models is to identify high-risk individuals who will benefit from aggressive lifestyle changes such as dietary prudence, smoking cessation, and regular exercise. In prediction algorithms like those derived from the Framingham Heart Study, however, risk calculation is highly dependent on aging and is presented to patients as an anticipated risk over the coming 10 years. Patients with calculated 10-year Framingham risk scores (FRS) <10% are considered to be at lower risk for vascular events during the next decade, whereas patients with scores between 10% and 20% are at moderate risk and those >20% are at higher risk.

See p 542

Although epidemiologically sound, this approach to risk classification has limitations in clinical practice. Consider a 30-year-old woman who is overweight, rarely exercises, smokes 2 packs of cigarettes daily, has stage II hypertension (systolic blood pressure >160 mm Hg) and severe hyperlipidemia (LDL cholesterol of 190 mg/dL and HDL cholesterol of 35 mg/dL). All physicians would recognize that this individual has very high lifetime vascular risk and would benefit greatly from immediate lifestyle interventions.

Clinical application of the FRS typically does not, however, involve a calculation of lifetime risk but focuses instead on 10-year risk. Using the original Framingham Risk tables based on LDL and HDL cholesterol measures, the calculated FRS for this patient is zero, conferring a 10-year risk of coronary heart disease of 2%, a very low risk category (Table 1, left). If no preventive effort is initiated and her current health habits continue for another 30 years, then this patient’s calculated FRS will increase by 17 points, her 10-year risk will exceed 32%, and she will be considered at extremely high risk (Table 1, right). Waiting to label this patient as “high risk” and thus in need of lifestyle intervention is a public policy error.

To make matters more complex, it is recognized that relationships between age and vascular risk are not necessarily static but may change in magnitude through interactions with other risk factors. In the most recent Framingham algorithms used in the National Cholesterol Education Program’s Adult Treatment Panel III that are based on total cholesterol rather than LDL cholesterol, interactions between age and hyperlipidemia and between age and smoking were included. In practice, such age-based interactions may result in puzzling risk estimates that can further undermine office-based prevention efforts.

Consider a second example of a 40-year-old woman with total cholesterol of 260 mg/dL and HDL cholesterol of 40 mg/dL who smokes and has a systolic blood pressure of 150 mm Hg. According to current ATP III risk tables based on total cholesterol, this woman has an FRS of 19 points, which corresponds to an 8% 10-year risk (Table 2, left).

Now let us examine what happens with aging, as in our previous example. Most clinicians would assume that with the passage of 20 years, this patient’s vascular risk will increase. This, however, is not what happens if the ATP III criteria are strictly followed. Because of the interaction terms introduced in the ATP III risk tables, a 60-year-old woman with an identical cholesterol pattern, identical blood pressure, and identical smoking history still has an FRS of 19 points, giving her yet again an 8% 10-year risk despite no prevention efforts during a 20-year period (Table 2, right).

The above examples should not be construed to suggest that age is not a fundamental determinant of coronary risk. In all major cohorts, age is in fact the single strongest risk factor for future vascular events; as William Osler observed, “We are as old as our arteries.” However, by emphasizing so strongly the impact of aging in coronary risk prediction models, we inadvertently underemphasize those risk factors that are modifiable early in life and that can greatly alter long-term outcomes.

A simple solution to this problem is to eliminate time dependency from Framingham-type algorithms and to calculate age-specific relative risks rather than 10-year absolute risks. By so doing, the patient in the first example would no longer be told that she is at low risk for a cardiovascular event in the next 10 years but instead would be informed that her lifetime risk is many times higher than that of women of the same age. For the patient in the second example, the confusion resulting from time-dependent smoking and cholesterol interactions would be eliminated because comparisons are

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657
made only to age-similar individuals. In each instance, an estimate of risk is communicated that can serve as a clear motivation to improve lifestyle habits now rather than waiting until 10-year risk estimates are high enough to trigger clinical concern.

Critics of this approach within the prevention community will argue that it is absolute risk, not relative risk, that must dictate intervention. This argument has merit, particularly when the intervention is a pharmacological prescription and cost becomes relevant; therapies like statins become cost-effective when absolute risk exceeds certain levels such as a 20% 10-year FRS. The way to solve this problem, however, is to fully disentangle risk prediction algorithms from pharmacological risk reduction strategies, not to insist that absolute risk is the only way to communicate clinically relevant information to our patients.

Implementation of such a policy shift is not difficult, but it does require the creation of 2 separate but equally important programs, one largely targeting patients and lifestyle intervention and the other largely targeting physicians and pharmacological interventions. The creation of a national risk detection program that clearly communicates age-specific relative risks to patients would be a major step forward in promoting exercise, smoking cessation, and dietary discretion in a manner that would augment rather than undermine current federal efforts at primordial prevention. This program would be directed toward patient education, use age-specific relative risks for communication, and be a strong motivational tool for the initiation of lifestyle changes early in life. At its core, this program would answer for each individual patient the question, “Compared with others of your age and gender, what is the likelihood that you will suffer a future heart attack or stroke?” This program also would deal explicitly with the immediate quality-of-life improvements that can be anticipated with simple behavioral interventions, in particular exercise and weight loss.

At the same time, the creation of a separate but integrated national pharmacological risk reduction program that clearly communicates absolute risk information to physicians would be a major step forward in promoting more appropriate use of pharmaceutical interventions. This program would be directed toward physician education and not only would emphasize clinical trial results but would also recognize the importance of outcomes research and cost-efficacy analyses in prescriptive decision making. At its core, this program would answer for each individual physician the question, “What magnitude of benefit is my patient likely to see if I prescribe this particular preventive medication?” The creation of separate risk detection and pharmacological risk reduction programs also would help limit the influence exerted by the pharmaceutical industry in the guideline process by placing substantially more distance between the question of “How high is my patient’s risk?” and the reflexive physician response of “What medication should I prescribe?”

It is recognized that the approach suggested here is a departure from current National Cholesterol Education Program guidelines, in which risk detection and risk reduction strategies are tightly linked. That separation may be crucial not only for better communication of risk information to our patients but also for continued credibility of risk reduction guidelines directed toward the aggressive use of targeted pharmacological interventions.

References

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