Age and Time Need Not and Should Not Be Eliminated From the Coronary Risk Prediction Models

Ramachandran S. Vasan, MD; Ralph B. D’Agostino, Sr, PhD

Risk assessment, risk communication, and risk management are 3 fundamental steps in the primary and secondary prevention of coronary heart disease (CHD). Consequently, national and international guidelines1-4 have been formulated to assist clinicians in providing standardized care for treating coronary risk factors. These guidelines are consistent with the best available scientific evidence on risks of developing CHD and potential strategies to reduce those risks via nonpharmacological and pharmacological interventions. One of the critical concepts on which contemporary guidelines are founded is the notion that the choice and intensity of an intervention strategy should in part be based on the underlying risk—ie, the absolute risk of experiencing a CHD event during a short-term period. This is typically estimated as the 10-year risk of CHD for a man or a woman of a specific age.1,3,4 In this issue of Circulation, Ridker and Cook5 present an argument to eliminate both the age and the time dependency of CHD risk prediction algorithms. On the basis of the objectives of current guidelines and risk prediction algorithms, we disagree with the suggestion made by Ridker and Cook. We submit that not only is such removal not necessary, but, to the contrary, such removal may be inappropriate. Furthermore, as we demonstrate below, the objectives desired by Ridker and Cook are already available with the existing prediction algorithms and often have been incorporated into the standard use of the current guidelines.

Current Recommendations for Approaching the Individual With Multiple Risk Factors and Low Short-Term CHD Risk (Patient Example 1)

The example in Ridker and Cook’s Table 15 is provided to demonstrate that a 30-year-old person with an adverse risk factor profile (LDL of 190 mg/dL, systolic blood pressure of 160 mm Hg, and smoking) but with a low 10-year absolute CHD risk because of age would not be treated appropriately. The implication is that use of relative risk would facilitate a better evaluation of the patient’s risk at an earlier age and we would not have to wait until the person reaches 50 years of age to recognize the seriousness of the risk profile. Both of these points are incorrect.

The major advance in the National Cholesterol Education Program’s Adult Treatment Panel (ATP) III report (relative to previous sets of recommendations) is incorporation of both short-term (10-year) and long-term (>10-year) risks into the clinical evaluation.1,6 Thus, the short-term 10-year CHD risk is not the standalone criterion for counseling. Careful consideration of the number and levels of risk factors is a critical component of the ATP III recommendations. Thus, treatment strategies in the ATP III guidelines are formulated for strata defined on the basis of both the numbers of risk factors and the estimated 10-year absolute CHD risk.1,6 The patient in Ridker and Cook’s first example6 has 3 risk factors in addition to high LDL cholesterol. The 10-year total CHD risk for this patient varies from 2% to 9% at ages 30 and 40 years (according to the Framingham scoring system7 that estimates the risk of total CHD including coronary deaths, myocardial infarctions, coronary insufficiency, and stable angina). The would somehow alter the perceptions of the treating clinicians so that such an individual may be treated more aggressively. Second, they point out (through their patient example 2) that CHD risk may be relatively static with increasing age (and greater duration of exposure) because of the diminishing impact of select risk factors with increasing age. Again, this arises because of the use of age and time as the logical scales for predicting CHD risk. Third, they propose 2 sets of programs to resolve what they perceive as a conflict in the strategy of targeting patients at high short-term risk, seemingly at the cost of advocating a less aggressive intervention strategy for individuals with lower short-term but high relative risk. They advocate using an absolute risk–based program for pharmacological risk reduction for the former and a relative risk–based program for lifestyle-related interventions for the latter. Let us scrutinize each of these points in the context of the current national guidelines.

The opinions expressed in this article are not necessarily those of the editors or of the American Heart Association.

From the Framingham Heart Study (R.S.V., R.B.D.), Framingham, Mass; the Department of Mathematics (R.B.D.), Boston University, Boston, Mass; and the Department of Preventive Medicine, Cardiology Section (R.S.V.), Boston University School of Medicine, Boston.

Correspondence to Ramachandran S. Vasan, MD, The Framingham Heart Study, 73 Mt Wayte Ave, Framingham, MA 01702-5803. E-mail vasan@bu.edu

(Circulation. 2005;111:542-545.)

© 2005 American Heart Association, Inc.

Circulation is available at http://www.circulationaha.org

DOI: 10.1161/01.CIR.0000156100.73739.B8

See p 657

Before we proceed, it would be useful to summarize the observations made by Ridker and Cook. First, they point out the possibility that young individuals with multiple risk factors and very low short-term CHD risk but a much higher lifetime CHD risk (patient example 1 in their article) may not be targeted adequately for lifestyle-related measures and pharmacological interventions that are likely to reduce lifetime CHD risk. This is a result of the perception of lower risk created by the use of “short-term absolute risk” as the metric for decision making. They argue that removal of age and time...
Framingham function used in the ATP III guidelines focuses on hard CHD (myocardial infarction and CHD mortality) risk estimates that are, in general, about two thirds to three fourths of total CHD event rates.\textsuperscript{1,6}

Recognizing the low short-term CHD risk for the patient in Ridker and Cook’s example 1,\textsuperscript{2,3} ATP III guidelines clearly delineate that the therapeutic aim for such an individual (multiple \(\geq 2\) risk factors, 10-year risk \(<10\%\)) is to reduce long-term \((>10\text{-year})\) risk by achieving an LDL cholesterol goal of 130 mg/dL.\textsuperscript{1,6} Indeed, current recommendations (per ATP III) for the individual in example 1 are to institute therapeutic lifestyle changes (TLC; including reduced dietary intake of saturated fats and cholesterol; dietary options to enhance LDL lowering; weight control, if applicable; increased physical activity; smoking cessation; and blood pressure control) for 3 months initially. If the LDL cholesterol goal is achieved, then the clinician should emphasize maintenance of TLC along with control of other risk factors and reevaluate the patient after 1 year. If the TLC regimen does not achieve an LDL target of \(<130\text{ mg/dL}\), then ATP III guidelines recommend TLC for another 3 months, followed by the option of prescribing LDL-lowering drugs if LDL levels are \(\geq 160\text{ mg/dL}\) at the end of the second period.\textsuperscript{1,6}

In other words, if ATP III recommendations are followed, the person in Ridker and Cook’s example 1 would be targeted at age 30 years and would not be left alone for 30 years to reach a 10-year CHD risk of 30\%, a possibility raised by the data presented in their Table 1. The therapeutic options (TLC) envisaged under the national risk detection program proposed by Ridker and Cook are already detailed and in place for this patient under ATP III. Furthermore, it is important to note that the Framingham scoring systems\textsuperscript{7} clearly compare the 10-year CHD risk in this patient with 2 references: In Ridker and Cook’s reference 1 to a person of similar age and sex but with (1) optimal levels of several risk factors and (2) average levels of several risk factors. In the ATP III guidelines, the same individual is compared with people with (1) optimal and (2) normal risk factor levels. Thus, the Framingham scoring system in their reference 1 compares the 9\% 10-year total CHD risk at age 40 for patient example 1 to the 2\% 10-year CHD risk in a similar woman with an “average” risk factor profile.\textsuperscript{7} This comparison yields a relative risk of about 4.5, which complements the absolute CHD risk estimates. Thus, the importance of the concept of relative risk for targeting the patient in example 1 is already built into the existing Framingham scoring systems.\textsuperscript{7} In particular, for the ATP III version of the Framingham scoring system, one can readily download an electronic Framingham risk calculator\textsuperscript{8} that produces a visual display of a person’s 10-year absolute CHD risk and the other 2 comparative risks (Figure).

**Relatively Invariant CHD Risk With Increasing Age in a Patient With Multiple Risk Factors (Patient Example 2)**

As noted previously, the unvarying risk factor profile at different ages for the patient in Ridker and Cook’s example 2\textsuperscript{2} seems to result in a constant absolute 10-year hard CHD risk with advancing age. It is worth clarifying that the absolute event rates in their Table 2 are for hard CHD events (in contrast to patient example 1, in which the rates are for total CHD) and are based on the ATP III point scoring system.\textsuperscript{1,6} The Figure provides such a display for the patient in Ridker and Cook’s example 2 at age 60 years via the electronic calculator. As is evident from the Figure, the absolute 10-year hard CHD risk of 12\% contrasts with 2\% for a person with “normal” risk factor levels (yielding a relative risk of 6) and with 1\% for a person with “optimal” levels of CHD risk factors (a relative risk of 12). The 12\% hard CHD rate differs slightly from the 8\% estimate noted in Ridker and Cook’s Table 2 because the electronic calculator uses Framingham risk equations that yield more precise CHD risk estimates; the ATP III point scoring system provides a close approximation.

The ATP III guidelines specifically emphasize that the lower points allocated to select risk factors at older ages should not be misconstrued to indicate a decreasing importance of these risk factors with advancing age.\textsuperscript{1,6} The guidelines also underscore that the relative benefit with risk reduction that is achieved with lowering LDL cholesterol or with smoking cessation is the same as it is in younger people. In other words, notwithstanding the invariant CHD risk with increasing age for the patient in example 2, the treatment LDL goal does not change with age (it remains \(<130\text{ mg/dL}\) for a person with multiple risk factors and 10\% CHD risk), and drug therapy is a consideration if TLC for 3 months does not lower LDL levels below the stated goal. In addition, as in patient example 1, because treatment strategies are based on both numbers of risk factors and absolute risk, the patient in example 2 will be targeted at age 40 years with TLC followed by drug therapy, if necessary. Lastly, the usual use of the ATP III risk scores incorporating the comparison to individuals with optimal and normal risk factor levels would clearly demonstrate the seriousness of the risk factor profile even at the young age of 40 years for the patient in the second example.

**Elimination of Age and Time From Prediction Algorithms and 2 Sets of Programs for Lowering Vascular Risk: Whose Risk Is It Anyway?**

There are several reasons, therefore, why we submit that we do not need 2 sets of programs, the first focusing on patients and using relative risk of CHD (eliminating age and time), and the other targeting clinicians and based on absolute CHD risk, as suggested by Ridker and Cook.

First, the 2 sets of programs envisaged would be largely redundant with the current ATP III guidelines,\textsuperscript{1,6} which integrate well with the complementary National Cholesterol Education Program\textsuperscript{9} and other strategies targeting the public health approach to improving vascular risk population-wide.\textsuperscript{10} A specific objective of ATP III that distinguishes it from previous reports is that it provides considerable flexibility to permit a wide variety of options for primary prevention.\textsuperscript{1,6} Thus, the objective of treating the patient in Ridker and Cook’s example 1 is to lower long-term CHD risk, and that for the patient in example 2 is to reduce both short-term and long-term CHD risks. In both cases, relative...
and absolute risks can be presented to patients with existing tools such as the electronic risk calculator.

Second, the dichotomy of approaches suggested (in terms of relative versus absolute risk) is problematic because it artificially separates the continuum of information and associated choices that must be offered to and discussed with patients by clinicians. Whether for the purpose of TLC or for pharmacological interventions, presentation of both absolute and relative risks to patients is critical. Perceptions of risks and benefits by both patients and clinicians are influenced strongly by the framing of risk information.11–16 Balanced communication is important because whereas the short-term absolute risk may over- or underemphasize the immediacy of risk, the relative risk may magnify the catastrophic nature of risk (eg, a relative risk of 6 for the patient in example 2 at age 60 years relative to an average person of similar age). Consequently, experts caution that the presentation of data as “relative risks” distanced from “absolute risks” to achieve professionally desirable goals (as proposed in Ridker and Cook’s national risk detection program) should be avoided because, although well intentioned, such framing may be perceived by some as “potentially manipulative.”11 Ridker and Cook note that “waiting to label” as high risk the patient in example 1 who is “in need of lifestyle intervention” is a “public policy error.” We believe that risk communication is a dialogue that neither labels nor dictates the need for intervention and involves 5 essential components (described by Epstein et al13): understanding the patient’s (and family members’) experiences and expectations; building a 2-way partnership; providing evidence in multiple easily understood formats, including both relative and absolute risks, preferably placed in the context of everyday risks with which the patient is familiar and including an unbiased discussion of uncertainties; presenting recommendations informed by clinical judgment, keeping individual patient preferences in perspective; and ascertaining patient understanding and agreement. It is important to accept that what constitutes a rational choice in certain situations will vary according to the several perspectives involved: those of the individual patient, public health, the medical profession, and the pharmaceutical industry.16
Ultimately, the choice to follow TLC alone in the face of high short-term absolute CHD risk or to pursue pharmacological intervention for reducing a relatively low long-term risk, although seemingly not rational from the clinician’s perspective, resides with the patient. It is well recognized that the attempt to provide standardized health care via guidelines may conflict with providing greater choice for patients and respecting individual autonomy.11

Third, adherence to the current set of guidelines is limited,17 and creating a new set of programs that do not represent (in our opinion) a major departure from existing ones may serve more to confuse than to improve risk management. For these reasons, we acknowledge the importance of points noted by Ridker and Cook but maintain that attention and effort may be better focused on improving patient and clinician education to promote awareness of these options within contemporary guidelines1,6 and on encouraging better methods of risk communication to facilitate rational choices.

Acknowledgments
This work was supported by the following grants: NHLBI/NIH Contracts #N01-HC-25195 (Drs Vasan and D’Agostino) and 2K24HL04334 (Dr Vasan).

References

Key Words: Editorials | coronary disease | risk factors | prevention | prognosis
Age and Time Need Not and Should Not Be Eliminated From the Coronary Risk Prediction Models
Ramachandran S. Vasan and Ralph B. D'Agostino, Sr

Circulation. 2005;111:542-545
doi: 10.1161/01.CIR.0000156100.73739.B8

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circ.ahajournals.org/content/111/5/542

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation is online at:
http://circ.ahajournals.org/subscriptions/