Medical Decision Making and the Counting of Uncertainty

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In economic theory, *homo economicus* is a concept used to explain decision making as a rational exercise. The “economic man,” to use the term often associated with the work of the utilitarian philosopher John Stuart Mills, is someone who makes decisions by carefully weighing the benefits and costs of his or her options and then deciding on a course of action that maximizes his or her utility. Although now considered overly simplistic, this idea is often implicit in how we as clinicians have traditionally approached medical decision making. In the case of statins for the primary prevention of cardiovascular diseases, the choice is frequently framed in terms of the tradeoff between the potential benefit of preventing a future heart attack or stroke (ie, utility) and the side effects and inconveniences of taking a medication (ie, disutility). Thus, the recently released 2013 American Heart Association/American College of Cardiology guideline on the treatment of blood cholesterol reminds us that, in addition to calculating estimated atherosclerotic cardiovascular disease risk to determine statin eligibility, we should engage with patients “in a discussion…to consider the potential for ASCVD [atherosclerotic cardiovascular disease] benefit and for adverse effects, for drug-drug interactions, and patient preferences for treatment.”

However, although much of the debate over the current guidelines has focused on the accuracy of risk estimation, the evidence base is limited for how to engage with patients during the decision-making process to assess their disutility for taking statin therapy. The reason is in part that, although the proportion of patients who report side effects can be measured, it is difficult to assign a numeric value to the aspect of disutility resulting from having to take a medication daily. In this issue of *Circulation*, Fontana and colleagues address this issue by surveying a random sample of 360 individuals encountered on London thoroughfares. Describing a hypothetical medication that has negligible costs and no side effects, the investigators used a time-tradeoff approach to ask the participants how much this medication must add to their lifespan before they are willing to take it daily. Medication disutility, measured in this way, was found to have a bimodal distribution. Although a third of the individuals surveyed had minimal medication disutility and were willing to take the hypothetical medication even if the benefit was <1 month, 12% of participants reported the highest level of medication disutility that the survey was able to measure and would refuse the hypothetical medication even if they could gain >10 years of life.

These findings should not surprise most clinicians, who often encounter patients resistant to the very idea of taking medications. Nonetheless, as the authors note, all too often disutility is assumed to be nearly zero for statins, for example, in published cost-effective analyses that have drawn favorable conclusions for broadening the use of statins. The basis for this assumption is unclear, although it appears to have been extrapolated from a very low level of disutility for warfarin and aspirin observed in previous studies of patients with atrial fibrillation. The present study by Fontana and colleagues is therefore an important step forward both for its development of a tool to quantify medication disutility and for its provocative finding that a significant minority of individuals in the general population may have high levels of medication disutility.

How might these results influence the day-to-day decisions of whether to recommend primary prevention statin therapy to individual patients? The authors provide some guidance by using the Systematic Coronary Risk Evaluation (SCORE) algorithm to calculate the distribution of estimated longevity benefit from statin therapy for various demographic and cardiovascular risk subgroups of the general UK population. The estimated longevity benefit for taking statins, when calculated in this way, ranges from 5.5 to 24.3 months of added life span for men and 3.6 to 18.2 months for women. Although these findings suggest that many individuals will have medication disutility that is numerically higher than their estimated longevity benefit, the authors are appropriately cautious to infer that this comparison should determine eligibility for statins at the individual level for several reasons. Because cardiovascular risk factors were not collected during the survey, the estimated longevity benefit could not be calculated at the individual level for this study. However, even if the data collection were complete, a direct comparison of estimated longevity benefit and medication disutility would be problematic. To see this, consider the hypothetical example of 2 individuals, A and B, both of whom are 60-year-old men who do not smoke, have a systolic blood pressure of 140 mmHg and total cholesterol of 5 mmol/L, and have medication disutility quantified as 5 years.

With the use of Figure 3 provided by the authors, the longevity benefit associated with statin therapy is 7.4 months for both of these men and is much lower than their medication disutility. Individual A stays off statins, never experiences a cardiovascular event, and is happy that he was able to avoid a lifelong course of preventive medications. Individual B, however, has a fatal heart attack at 65 years of age that could have been prevented by taking a statin and loses an extra 15 years of life span. In his case, it would be hard to justify the decision not...
to offer him statin therapy on the grounds that his medication disutility greatly outweighed his estimated longevity benefit. The point of this example is not that medication disutility should not be a part of the decision-making process for statin therapy but that, because of the inherent uncertainty for estimating any particular individual’s cardiovascular risk, a direct comparison of medication disutility and estimated longevity benefit can be misleading. At an epistemological level, regression-based methods such as the SCORE algorithm and the Pooled Cohorts Equation recommended by the recent guidelines can arrive at an averaged risk only for all individuals who share the same risk profile and therefore cannot predict with certainty whether any given individual will go on to have a cardiovascular event. Furthermore, there has been recent recognition that uncertainty in cardiovascular risk estimation can be caused by the poor concordance between different risk equations and by variability in the factors used to estimate risk such as variability in systolic blood pressure or the level of C-reactive protein.

On the other side of the utility equation, the determination of patient preferences such as medication disutility is also fraught with uncertainty. Just as framing and cognitive biases affect perceptions of risks, medication disutility is also likely to be fluid and context dependent. The substantial differences between the level of medication utility described here and those expressed by patients with atrial fibrillation in previous studies could be due in part to differences in how the questions were asked (concerning a hypothetical tablet versus familiar medications, aspirin or warfarin) and the settings in which participants were interviewed (in a public place versus a research office). Finally, the mere quantification of medication disutility does not address the deeper question of why. When faced with a patient who is resistant to taking medications that could have important health benefits, a truly patient-centered approach requires the insightful physician to explore the reasons such as whether the concerns are justified misgivings for our overreliance on medications to treat lifestyle diseases or whether the disutility represents fears about side effects that are misperceived or misattributed.

In the social and behavioral sciences, it has been increasingly recognized that rational decision making is more nuanced than the simple weighing of utility and disutility and is bounded by incomplete information, uncertainty, and the cognitive limits of the mind. This perspective of bounded rationality could also improve how we approach medical decision making at the level of the individual patient. Increasingly, shared decision making is emphasized to ensure that individual patients can make “informed, evidence-based decisions that are consistent with their values and preferences.” Although the science of shared decision making has advanced our understanding of how to communicate quantitative risk, the work by Fontana and colleagues in this issue of Circulation reminds us that we still lack evidence-based approaches to incorporate patient preferences such as medication disutility into the shared decision-making process. As our understanding of cardiovascular risk continues to be refined, how to account for the uncertain calculus of risk, benefits, and preferences at the individual level will be a central challenge for the practice of personalized cardiovascular medicine.

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References


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