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Malcolm Man-Son-Hing, Andreas Laupacis, Annette M. O'Connor, Douglas Coyle, Renee Berquist and Finlay McAlister

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Health Outcomes and Preferences

Patient Preference–based Treatment Thresholds and Recommendations:

A Comparison of Decision-analytic Modeling with the Probability-tradeoff Technique

MALCOLM MAN-SON-HING, MD, MSc, ANDREAS LAUPACIS, MD, MSc, ANNETTE M. O'CONNOR, RN, PhD, DOUGLAS COYLE, MSc, RENEE BERQUIST, BScN, FINLAY McALISTER, MD

Background. Decision analysis (DA) and the probability-tradeoff technique (PTOT) are patient preference–based methods of determining optimal therapy for individuals. Using aspirin therapy for the primary prevention of stroke and myocardial infarction (MI) in elderly persons as an example, the objective of this study was to determine whether group-level treatment thresholds and individual-level treatment recommendations derived using PTOT are identical to those of DA incorporating the patients' own values. Methods. Persons in a pilot study of the efficacy of aspirin in the prevention of stroke and MI were asked to participate. Participant values and utilities for pertinent health states (e.g., minor and major stroke, MI, major bleeding episode) were determined. Then, in three hypothetical clinical situations in which the chance of stroke or MI was varied, PTOT was used to directly determine treatment thresholds for aspirin therapy (i.e., the smallest reduction in MI or stroke risk for which participants would be willing to take aspirin). Using DA modeling, with the same probabilities of events as in the PTOT exercise and incorporating participants' own values, treatment thresholds for the three clinical situations were determined. The thresholds determined by the two approaches were compared. Finally, based on these treatment thresholds, using the best estimates of the efficacy of aspirin to prevent first-time stroke and MI, PTOT and DA treatment recommendations for individual participants were compared. Results. The 42 participants reported that a major stroke was the least desirable health state, followed by Mi, minor stroke, and major bleeding. The minimum risk reduction required to take aspirin was greater for MI prevention compared with stroke prevention. For the two clinical situations in which the hypothetical efficacy of aspirin to prevent stroke was varied, treatment thresholds for the PTOT versus DA approaches differed (p < 0.04), but this difference was not significant (p = 0.19) for the MI-based clinical situation. Using the best estimate of the efficacy of aspirin to prevent first-time stroke and MI, PTOT and DA treatment recommendations whether or not to take aspirin were discordant for 38% of participants (16 of 42) (p < 0.001). Conclusions. Patient preference–based group-level treatment thresholds and individual-level treatment recommendations can differ significantly depending on whether PTOT or DA is used, apparently because the two emphasize different aspects of the decision-making process. DA theory assumes that effective therapeutic decision making should maximize both quality and quantity of life; with PTOT, the emphasis for effective clinical decision making allows patients to be fully engaged in the process, thus hopefully leading to fully informed decisions that may result in satisfaction and compliance. Key words: decision making; decision analysis; patient preferences; treatment thresholds. (Med Decis Making 2000;20:394–403)
Physicians are often forced to choose therapy under conditions of uncertainty. Adding to the complexity is that individual patients may have their own opinions about the value of further treatment. Physicians have traditionally dealt with these uncertainties by using an intuitive approach, modeled on the actions of their teachers and tempered by experience. The discipline of medical decision making offers an alternative approach to deal with this uncertainty. Its method is explicit and transparent, allowing a critical examination of the expected benefits and risks of clinical choices. Within the bounds of medical decision making are two different patient preference-based approaches to determining optimal therapy; decision-analytic (DA) modeling and the use of probability-tradeoff techniques (PTOTs).

Decision analysis utilizes computer simulation and involves construction of a decision tree that models the clinical situation. Using best estimates of the probabilities of the outcomes and patients' utilities for these outcomes, DA determines optimal treatment choices for patients in a highly objective, rational manner. DA is usually utilized to clarify best treatment options for cohorts of patients in similar clinical situations who are facing similar treatment options, but may also be used to optimize treatment choices for individual patients.

A second, newer approach to determining optimal therapy for individuals is the direct assessment of patient preferences for treatment using PTOTs. Patients are presented with information about options, outcomes, and associated probabilities. Then, an additional step is taken: the efficacy of the treatment options is systematically varied until patients switch their treatment preferences. In essence, individuals participating in PTOT exercises are, "standing at the actual decision-point of treatment selection and looking down the [decision-analytic] decision tree towards the possible outcomes of treatment." Thus, in these exercises, participants are expected to handle the probabilistic information intuitively. PTOT exercises foster patients' participation in the decision-making process by helping them to understand the uncertainties in the treatment choices, and to articulate their preferences. Such a process may promote patient confidence in the decisions that are eventually taken, possibly leading to better compliance. The PTOT approach is most commonly used to help individual patients make treatment decisions, but it also can be used to give treatment indications for cohorts of patients.

In summary, while the goal of both PTOT and DA modeling is to use a preference-based approach to determine optimal therapy for individuals and groups of patients, the methods used to reach this goal are different. PTOT takes a predominantly qualitative approach, while DA takes a predominantly quantitative one.

No empiric study has documented whether treatment thresholds and recommendations derived from the two approaches are similar. The objective of this study was to determine whether preference-based group-level treatment thresholds and individual-level treatment recommendations are the same whether using a PTOT approach or DA incorporating patients' own values.

Aspirin for the primary prevention of myocardial infarction (MI) and stroke in elderly persons was used as an example. There is convincing evidence that aspirin is effective in the secondary prevention of MI and stroke. In randomized controlled trials involving patients with previous MI and stroke, regular aspirin use reduced the relative risk of recurrent events by 25–30%. However, for persons without previous MI or stroke (i.e., primary prevention), while regular aspirin use appears to offer the same relative 25–30% benefit in the reduction of first-time MI, there may be an absolute increase in stroke rate of 10%. Therefore, whether there is overall benefit of regular aspirin use in these persons is unclear, making this clinical situation a good example for study.

### Methods

The study protocol was approved by the Research Ethics Committee of the Ottawa Hospital, Civic Campus, Ottawa, Ontario. A single research nurse (RB) conducted all study interviews.

### PARTICIPANTS

Participants were recruited from the group practice of four family physicians by examining their computer databases and medical records. These participants had initially been for a pilot study assessing the efficacy of aspirin for the primary prevention of vascular events (MI and stroke) in elderly persons (APPLE—the Aspirin for Primary Prevention in the Low-risk Elderly trial). The major inclusion criteria for APPLE were that participants: be 65 years of age or older, have no clinically manifest atherosclerotic vascular disease (i.e., no history of symptomatic cardiovascular, cerebrovascular, or peripheral vascular disease), and have no indication or contraindication for regular aspirin use.

All persons who had been randomized into the APPLE pilot study were asked to participate in this study. For each participant, data were collected regarding date of birth, gender, education level, previous use of aspirin, and cognitive status. Participants were taking the APPLE study medication at the time of the study interview.
VALUES FOR HEALTH STATES

During a structured face-to-face interview lasting approximately 30 minutes and using a prewritten text, the study nurse described to participants the following health states (see the appendix): minor stroke (corresponding to a Rankin18 1–2 stroke), major stroke (corresponding to a Rankin16 4–5 stroke), MI, major bleeding episode, perfect health, and taking a pill every day. These descriptions had been previously extensively pilot tested for content and comprehensibility.12

Values for the health states were determined using the visual analog scale (VAS) technique.19 After the description of each health state (e.g., major stroke, MI), participants were asked to judge its desirability (or undesirability) by marking a line on a 10-cm VAS that was anchored at one end by "death" and at the other by "perfect health." The value for the health state was then determined by dividing the distance the mark was made from the end anchored by "death" by 10 cm. Participants were also asked to judge their current health in the same manner.

PTOT TREATMENT THRESHOLDS

Using visual and verbal aids (see figure 1 for an example), the following baseline probabilities regarding outcomes without aspirin use were presented:

1. a 5 out of 100 chance of MI over the next five years,14,15 with the outcomes for those having MI being 50% fatal, 25% having recurrent angina when performing everyday activities, and 25% returning to their pre-MI functional status20–22;
2. a 5 out of 100 chance of stroke over the next five years,14,15 with the outcome for those having a stroke being 25% fatal, 25% having a major stroke, and 50% having a minor stroke23–25;
3. the chance of a major bleeding episode over the next five years was given as 1 out of 100.13

Then, again using visual and verbal aids (see figure 1 for example), the participants' treatment thresholds were determined. The treatment thresholds were defined as the smallest risk reduction in MI or stroke for the efficacy of aspirin that was sufficient for the participants to want to take aspirin, as opposed to not want to take aspirin. Treatment thresholds were determined for three different clinical situations.

In clinical situation 1, the participants were presented with two choices: 1) not to take aspirin, given the above information; or 2) to take aspirin, which will hypothetically reduce their chance of MI to 3 out of 100, but increase their chance of a major bleeding episode to 2 out of 100 over the next five years (with the chance of stroke held constant, remaining at 5 out of 100).

Depending on the participants' initial choices, using the titrating elicitation method,13 the chance of MI was systematically varied up or down until the participants' switched preferences. These switches in preference were recorded as their PTOT treatment thresholds for MI prevention. For example, if the smallest risk reduction for which a participant would take aspirin was from a 5 out of 100 chance of MI if not taking aspirin to a 3 out of 100 chance of MI if taking aspirin (40% relative risk reduction), then this was recorded as the treatment threshold. The smallest gradation of risk reduction attempted was 0.5 out of 100.

For clinical situation 2, the identical procedure was followed except the chance of stroke (instead of MI) was systematically varied until PTOT treatment thresholds for stroke prevention were determined.

For clinical situation 3, the participants were asked to imagine that taking aspirin would reduce the chance of MI by 30% (to 3.5 out of 100 over next 5 years). Then, the chance of stroke was systematically varied until a PTOT treatment threshold was determined. Note that while clinical situations 2 and 3 both determine a stroke risk-reduction threshold,
there are different fixed MI risk reductions in the two (clinical situation 2, no reduction in MI risk when taking aspirin; clinical situation 3, fixed 30% reduction in MI risk when taking aspirin). Thus, it was not expected that the treatment thresholds for stroke risk reduction would be the identical in these two clinical situations. In fact, for clinical situation 3, participants might be willing to accept an increased chance of stroke when taking aspirin in order to gain the 30% reduction in MI risk.

**DECISION-ANALYTIC TREATMENT THRESHOLDS**

A Markov DA model (figure 2) was developed to simulate the three clinical situations. Each of the 20 Markov cycles was set at three months for a total duration of five years, the same time frame presented to patients in the PTOT exercise. The time horizon of five years was used for two reasons: 1) data regarding the efficacy of aspirin for primary prevention of stroke and MI are available for this time horizon, and 2) in the PTOT exercise, we presented the pertinent data for this time horizon. For each respective clinical situation, probabilities of events (MI, stroke, major bleeding episode) and outcomes of these events identical to those presented to participants in the PTOT exercise were incorporated into the DA model. Future life years were discounted at the rate of 3% per year. Persons who had an event in which they did not return to the “well” state were assumed to remain in that state for the remaining cycles.

To determine the participants’ DA treatment thresholds for the three clinical situations, their values for the different health states were incorporated into the Markov model. Then, threshold analysis (varying the efficacy of aspirin to prevent MI or stroke) was used to determine treatment thresholds. These thresholds were defined as the smallest risk reduction in MI or stroke for the efficacy of aspirin that was sufficient to provide benefit in terms of quality-adjusted life years (QALYs), compared with not taking aspirin at all. Thus, these thresholds were directly comparable to the PTOT-derived treatment thresholds.

**TREATMENT RECOMMENDATIONS**

For an individual participant, once treatment thresholds using the PTOT and DA approaches have been derived, for a given efficacy of aspirin (real or hypothetical) a treatment recommendation (e.g., take or not take aspirin) can be made. For example, if the individual had PTOT- and DA-derived MI treatment thresholds of 50% and 10%, respectively, using the best estimate of aspirin’s efficacy to prevent MI (30% relative reduction), the PTOT-derived treat-
ment recommendation for this person would be not to take aspirin, while the DA-derived recommendation would be to take aspirin. At a given efficacy of aspirin to prevent stroke or MI and using the treatment thresholds derived from the three clinical situations, PTOT and DA treatment recommendations for individual participants were determined and compared.

PARTICIPANT PREFERENCES FOR THE PTOT VERSUS DA

Participants were asked to return for a second interview, during which they were presented with their individual treatment thresholds as determined by the PTOT and DA approaches. They were then asked to judge, "which of the two estimates (PTOT or computer modeling) would you base your decision to take aspirin for stroke and heart attack prevention on?" Responses were recorded on a five-point Likert scale, with a = completely on my own judgment; b = mostly on my own judgment; c = equally on my own judgment and the computer modeling; d = mostly on the computer modeling; and e = completely on the computer modeling.

DATA ANALYSIS

Means and standard deviations (SD) were calculated for pertinent participant characteristics. Given that the goal of both PTOT and DA is to identify the optimum patient-preference-based treatment thresholds (at the group level) and recommendations (at the individual level), their treatment thresholds and recommendations in the same clinical situation should be identical. Therefore, data were analyzed under this assumption. Differences in group-level treatment thresholds between the PTOT and DA techniques were compared using Wilcoxon signed-rank tests. For individual-level treatment recommendations, the discordance between the PTOT and DA techniques was analyzed using one-sample testing for binomial proportions. In order to avoid type I error due to multiple comparisons, a conservative level of statistical significance (alpha of 0.01) was used.

Table 1 • Participant Values for Health States

<table>
<thead>
<tr>
<th></th>
<th>Minor Stroke</th>
<th>Major Stroke</th>
<th>Heart Attack</th>
<th>Stomach Bleed</th>
<th>Taking a Pill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.70</td>
<td>0.16</td>
<td>0.57</td>
<td>0.79</td>
<td>0.93</td>
</tr>
<tr>
<td>SD</td>
<td>0.18</td>
<td>0.16</td>
<td>0.26</td>
<td>0.18</td>
<td>0.14</td>
</tr>
<tr>
<td>Median</td>
<td>0.74</td>
<td>0.11</td>
<td>0.55</td>
<td>0.80</td>
<td>0.995</td>
</tr>
<tr>
<td>Range</td>
<td>Low</td>
<td>0.17</td>
<td>0.00</td>
<td>0.04</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>0.95</td>
<td>0.55</td>
<td>0.94</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Table 2 • Comparison of Participant-preference-based Treatment Thresholds (SD): Probability-tradeoff Technique versus Decision Analysis

<table>
<thead>
<tr>
<th>Treatment Threshold*</th>
<th>Probability-tradeoff Technique (PTOT)</th>
<th>Decision Analysis (DA)</th>
<th>P-value† PTOT vs DA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical situation 1 (vary MI RR†)</td>
<td>Mean 0.45 (0.31)</td>
<td>0.58 (0.39)</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Median 0.35</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Clinical situation 2 (vary stroke RR)</td>
<td>Mean 0.32 (0.28)</td>
<td>0.59 (0.39)</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Median 0.20</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td>Clinical situation 3 (vary stroke RR, fixed 30% MI RR)</td>
<td>Mean 0.07 (0.36)</td>
<td>0.38 (0.56)</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>Median 0.00</td>
<td>0.08</td>
<td></td>
</tr>
</tbody>
</table>

* Minimum risk reduction (%) required by participants to take aspirin on a chronic basis.
† Wilcoxon signed-rank test.
‡ MI = myocardial infarction; RR = risk reduction.

Results

Forty-two of the 48 persons who were randomized into APPLE at this site agreed to participate in this study. The average age of participants was 71 years (range 65 to 85), 16 (38%) were female, and 30 (71%) had a high school education or better.

Table 1 shows the mean values for the different health states. In general, the participants reported that a major stroke was the least desirable health state, followed by MI, minor stroke, major bleeding, and "taking a pill every day." When determining the participants' values for "taking a pill every day," for those attempting to make a mark on the VAS as close as possible but not on the line indicating "perfect health" (n = 18), a value of 0.995 was assigned.

In the three clinical situations, almost all of the participants (40 of 42) were willing to take aspirin for a smaller reduction in the risk of stroke compared with MI. This was consistent with participants' rankings of the desirability of health states. That is, since stroke (especially major stroke) was generally considered a less desirable health state than MI, the participants logically demanded a smaller risk reduction for stroke (compared with MI) in order to take aspirin. The treatment thresholds determined by DA were very sensitive to the value of "taking a pill every day." Regardless of the values of other health states, when the value of "taking a pill every day" was less than 0.95, DA modeling determined that aspirin should not be taken for any reduction in stroke or MI risk. Conversely, for the
seven participants who reported that "taking a pill every day" had no impact on their quality of life (i.e., a value of 1.0), DA determined that aspirin should be taken for any reduction in MI and stroke risk.

Table 2 shows the PTOT and DA preference-based treatment thresholds for the three clinical situations. In each clinical situation, participants using the PTOT approach were willing to take aspirin for smaller risk reductions in MI and stroke than those determined by DA. For clinical situations 2 and 3 (vary stroke risk reduction for aspirin), the PTOT and DA treatment thresholds were significantly different (p < 0.01), but they were not different for clinical situation 1 (vary aspirin’s MI risk reduction) (p = 0.08).

For the three clinical situations, table 3 compares the PTOT and DA treatment recommendations regarding whether to take or not to take aspirin for these individuals. Using the individual participants’ MI treatment thresholds determined for clinical situation 1, at a relative efficacy of aspirin to prevent MI of 30%, treatment recommendations were discordant for 62% of the participants (26 of 42). For clinical situation 2, at a relative efficacy of aspirin to prevent stroke of 30%, treatment recommendations were discordant for 55% of the participants (23 of 42). For clinical situation 3, at the best estimate of aspirin’s efficacy (30% MI relative risk reduction, 10% relative increase in stroke rate), 38% of the participants (16 of 42) had discordant PTOT and DA treatment recommendations. Under the assumption that the two techniques should generate the same treatment recommendations in identical clinical situations, all of these comparisons reached statistical significance (p < 0.001).

Thirty of the 42 participants rated the strengths of their preferences for the PTOT and DA approaches. Thirteen (43%) were more likely to base a decision whether to take aspirin on the results of the PTOT exercise, five (17%) on the DA, and 12 (40%) gave equal weight to both approaches.

**Discussion**

The results of this study demonstrate that patient-preference-based group-level treatment thresholds and individual-level treatment recommendations may be significantly different depending on whether a PTOT or DA approach is used. These differences are also likely to be clinically significant as, depending on the clinical situation, 38% to 62% of the individual participants in this study received different treatment recommendations about whether to take aspirin depending on whether a PTOT or a DA approach was used. Previous studies have shown that when performing decision analyses, due to the variability of individual utilities, the application of group-level utilities often results in treatment decisions that are inconsistent with those derived from individual-level utilities. These authors state that caution is necessary in applying DA group-level treatment recommendations to individual patients. Interestingly, the results of this study suggest that caution may also be necessary when applying DA individual-level treatment recommendations to individual patients.

Considering that the objective of both the PTOT and the DA the approaches is to establish optimal therapy for individuals and cohorts of patients, the differences in treatment thresholds and recommendations require explanation. Optimal clinical decision making should not only maximize both quality and quantity of life, but also be informed, consistent with personal values, and acted upon. With the theoretical underpinnings of DA theory being based on mathematical probability and utility theory, it
clearly assumes that effective therapeutic decision making should maximize both quality and quantity of life. Alternatively, PTOT decision making has its grounding in the psychological and behavioral sciences. Using this approach, the emphasis for effective clinical decision making is one that allows patients to be fully engaged in the process, thus hopefully leading to fully informed decisions that result in high levels of overall satisfaction and compliance. Thus, the two approaches emphasize different aspects of the optimal clinical decision-making process.

Which emphasis is more important to patients probably depends upon the characteristics of the individual patients. In this study, some individuals would have switched treatment preferences when informed that their PTOT choices did not maximize their quality and quantity of life. Conversely, many individuals chose to place more weight on the results of the PTOT exercise even when informed that this approach would not maximize their quality and quantity of life. Future studies are necessary to determine the ideal method of balancing these two, sometimes competing, aspects of the medical decision-making process.

Compared with DA, the risk reductions for MI and stroke necessary to take aspirin were smaller using the PTOT approach. The decision whether to take aspirin in the three clinical situations presented to participants balanced the possible benefits (reduced chance of MI and stroke) versus the disadvantages (taking a pill every day, increased chance of major bleeding). When making treatment decisions, the explicit descriptions of MI and stroke used during the PTOT approach may have resulted in participants' focussing on, and emphasizing, the prevention of these relatively rare events. If this occurred, then the participants would be likely to lean towards taking aspirin for smaller treatment benefits than those determined by DA. Conversely, in the DA model, if taking a pill every day had any meaningful impact on the participants' quality of life (i.e., values less than 0.95), then the model determined that they should not take aspirin under any circumstances. Thus, the model was extremely sensitive to the inconvenience of taking a pill every day, with incremental changes in this parameter having much greater impact on the model than similar changes in the values of relatively rare events such as MI and stroke.

For the PTOT exercise, the differences in treatment thresholds were greater for the stroke-based clinical situations (2 and 3) compared with the MI-based situation (1). In general, the participants considered stroke (especially major stroke) to be a worse clinical outcome than MI. Therefore, on average, to take aspirin they required a smaller risk reduction in stroke than in MI. However, in the DA model, because of the relative rarity of MI and stroke events, differences in the values of minor and major stroke and MI had little influence on the treatment thresholds for the clinical situations. Thus, from a DA perspective, PTOT caused the participants to overemphasize the relative importance of highly undesirable but relatively rare events.

By using the same probabilities for stroke (minor and major), MI, and major bleeding for both the PTOT exercise and the DA model, we attempted to compare treatment thresholds of the two approaches based on the same information. Clearly, other factors influenced the participants' PTOT choices. For example, two participants would not have taken aspirin even if the medication offered full protection from MI or stroke. Both of these individuals stated that their decision making was influenced by first-hand knowledge of persons who had had bad experiences when taking aspirin. It is doubtful that the results of a DA model would have changed their minds. Thus, for these individuals, it was apparent that DA modeling would not capture their preferences for treatment. Such individuals also highlight the possible tension between the two approaches. It clearly would be unreasonable to prescribe therapy that patients refuse to take, even if it would maximize their quality and quantity of life. It is also just as unreasonable to prescribe therapy that patients prefer if no therapeutic benefit can be expected. Negotiating this balance between the choices of individual patients and maximizing therapeutic benefit appears to be key to optimum clinical decision making. Clinicians are clearly in the best position to guide patients through this process. Therefore, while both the PTOT and the DA approaches allow greater participation by patients in the decision-making process, this finding confirms that these technologies are adjuncts, rather than replacements, for the patient–clinician interaction.

Overall, the participants appeared to understand the interview procedures well. There was excellent consistency regarding the reporting of the desirability of the different health states, with major stroke and taking a pill every day having the lowest and highest values, respectively. Regarding participant responses for the PTOT approach, there was also consistency when comparing the treatment thresholds for the three clinical situations. Considering that a mean MI risk reduction of 45% was necessary for the participants to take aspirin in clinical situation 1, it was consistent that when offered a fixed 30% MI risk reduction in clinical situation 3, the participants reported that additional stroke protection (albeit a small amount) was also required to convince them to take aspirin. However, a few partici-
pants reported values that appeared clinically unreasonable. For example, one person reported a lower value for taking a pill every day than for a major stroke. Previous studies have also reported that not all participants were able to fully comprehend the information required to complete utility and PTOT assessments.

This study has some possible limitations. First, there may be concern over the use of health-state values derived from a VAS as opposed to utilities. Utility assessment via standard gamble is argued to be the superior form of health-state preference elicitation due to its requirement that, unlike scaling with the VAS, states are valued through a process of choices made under uncertainty. Prior to initiation of the study, because of the complexity of the standard gamble procedure, there were significant concerns regarding the burden of asking respondents to rate all health states by standard gamble. In an attempt to address this possible limitation, we used the conversion curve \[(1 - u) = (1 - v)^a\] described by Furlong and colleagues to transform values for health states obtained with use of the VAS technique to utilities. In this process, for each study participant, we used the standard gamble technique to determine the utility of a major stroke. Thus, having both a value and a utility for a major stroke, we were able to determine the exponent of the power curve. Then, using the above formula, all other health state values were converted to utilities. The results of the comparison of PTOT and utility-based DA treatment thresholds and recommendations were very similar to the results of the PTOT and value-based DA comparisons. Further details of this analysis are available from the authors.

Second, some of the PTOT and DA treatment threshold-comparisons did not reach statistical significance but might have if a greater number of participants had been available for interview. Third, the chance of recurrent events (e.g., increased chance of a second stroke after having a first) was not included in the DA model, nor were the participants informed of this possibility. We believed that adding this information was not necessary to meet the objectives of this study because doing so would have added complexity to the interview process and not improved the internal validity of the study. Fourth, the sensitivity of the DA model to the value of taking a pill every day was not anticipated in the design of the study. Recently, after this study was completed, Augustovski and colleagues reported this. There was difficulty with precisely measuring the value for this health state on the VAS scale (i.e., many measurements were in the area of 0.5 to 10.0 cm). However, the participants’ values for this health state were very consistent with those determined by an other study (median value, 1.0; mean value, 0.998).

Fifth, we presented a simplified clinical situation to the participants, and then developed a DA model incorporating the same information. Information such as the baseline rates of mortality (i.e., life tables) were not presented to these patients during the PTOT exercise and were not incorporated into the DA model. Thus, the DA model did not simulate the actual clinical situation with sufficient adequacy to produce reliable treatment recommendations for actual patients. For this reason, the impact of the fixed five-year life expectancy with different treatment strategies and the quality-adjusted life-years results derived from the model may be misleading, and have not been reported. Sixth, with no previous empiric study comparing the two techniques, we used the strictest criterion of expecting identical treatment thresholds and recommendations when comparing the two techniques. However, depending on the seriousness of the clinical condition and its consequences, some tolerance of this strict criterion may be appropriate. Finally, it is doubtful whether PTOT and DA preference-based approaches are of equal utility in all clinical situations. In this study, we compared the treatment thresholds and recommendations in a clinical situation in which the possible outcomes of treatment were limited. The more complex the clinical situation, the more impractical the use of PTOT exercises may become. In such situations, DA may be the only viable approach to determining patient-preference-based treatment thresholds and recommendations.

This study also has an important strength. To our knowledge, it is the first study to provide empirical evidence that preference-based treatment thresholds and recommendations can differ significantly depending whether a PTOT or a DA approach is used. Clinicians should be cautious in recommending treatment options to patients based solely on the results of a single preference-based approach.

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