Subjective Numeracy and Preference to Stay with the Status Quo

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Background: Preference for the status quo, or clinical inertia, is a barrier to implementing treat-to-target protocols in patients with chronic diseases such as rheumatoid arthritis (RA). The objectives of this study were to examine the influence of subjective numeracy on RA-patient preference for the status quo and to determine whether age modifies this relationship. Methods: RA patients participated in a single face-to-face interview. Numeracy was measured using the Subjective Numeracy Scale. Treatment preference was measured using Adaptive Conjoint Analysis. Results: Of 205 eligible subjects, 156 agreed to participate. Higher subjective numeracy was associated with lower preference for the status quo in a regression model including race, employment, and use of biologics (adjusted odds ratio [95% confidence interval] = 0.71 [0.52–0.95], P = 0.02). Higher subjective numeracy was protective against status quo preferences among subjects younger than 65 years (adjusted odds ratio [95% confidence interval] = 0.64 [0.43–0.94], P = 0.02) but not among older subjects. Conclusions: Subjective numeracy is independently associated with younger, but not older, RA patients’ preferences for the status quo. Our results add to the literature demonstrating age and numeracy differences in treatment preferences and medical decision-making processes. Key words: decision making; aging; numeracy; status quo bias. (Med Decis Making 2015;35:6–11)

When faced with a choice between changing treatment versus maintaining current treatment, patients frequently prefer the latter even when change is associated with a more favorable risk-benefit ratio.1–3 This observation, frequently referred to as clinical inertia or preference for the status quo, may be an important barrier to implementing treat-to-target protocols that have been shown to improve outcomes in chronic diseases such as diabetes,4–6 hypertension,7,8 and rheumatoid arthritis (RA).9–11 Although the specifics of treat-to-target protocols vary, they all include frequent monitoring with subsequent treatment adjustments to minimize disease activity or severity. To improve the quality of care delivered to patients, it is important to understand the factors underlying reluctance to change treatment.

The decision to stay with the status quo versus opt for a new treatment is ideally based on a critical evaluation of the probabilities of both positive and negative outcomes associated with each option. Several seminal papers have highlighted relatively low levels of numeracy in the adult population and the resulting difficulty patients have in understanding,
processing, and applying the numerical information required to make informed decisions. Moreover, while treatment decisions are made more often by older adults than any other age group because of the various illnesses brought on by the aging process, information processing changes with age such that, compared with younger adults, older adults are less numerate. This innumeracy may be an impediment to making unbiased treatment decisions.

In this study, we sought to examine the influence of subjective numeracy on RA-patient preferences for the status quo: that is, choosing to remain with active disease on their current treatment versus adopting a new treatment associated with a potentially better risk-benefit profile. We also examined whether age modifies these relationships.

METHODS

Subjects

RA patients, currently under the care of 1 of 4 community-based rheumatology practices, were sent a letter describing the study. The letter notified potential participants that they would be telephoned by a research assistant, and they were offered the opportunity to refuse this contact by calling an answering machine and leaving a message. During the telephone call, the research assistant confirmed the following inclusion criteria: Participants were at least 18 years of age, had seen their rheumatologist at least 2 times in the past 12 months, experienced pain of at least 3 on an 11-point numeric rating scale, and currently were taking at least 1 disease-modifying drug. These criteria were included to ensure that subjects had access to a rheumatologist and were eligible to change treatment. Patients reporting a contraindication to biologics were excluded. Participants were given $25. The study protocol was approved by the Yale University Human Research Protection Program.

Measures

All data were collected using self-report during a single face-to-face interview. Numeracy was measured using the 8-item Subjective Numeracy Scale. Item responses were averaged, and this average subjective numeracy score (average scores ranged from 1 to 6) was used for all analyses. Treatment preference was measured using an Adaptive Conjoint Analysis (ACA) survey (Sawtooth Software, Inc, Sequim, Washington). The ACA survey for this study was developed to measure patient preferences for a biologic associated with improved expected benefits as well as an increased risk of toxicity versus remaining with the status quo: that is, no improvement in current joint symptoms, function, or ability to work; no effect on disease progression; and no increase in the risk of toxicity (a description of the treatment characteristics is included in the online appendix). All characteristics were described using lay terminology. Three rheumatologists, 5 patients with RA, and 2 researchers in medical decision making reviewed the attribute descriptions to confirm that the characteristics included were easy to understand and represented the most salient medication characteristics relevant to the decision to escalate care in RA. The ranges of probabilities of benefits and common adverse effects included in the survey were based on randomized controlled data. Rare adverse events were obtained from observational data. We used qualitative and quantitative frequency formats to describe the likelihood of adverse effects and illustrated this information using pictographs.

Patient-reported disease activity was measured using the RAPID-4, which includes 4 components of the Multi-Dimensional Health Assessment Questionnaire: physical functional assessment, arthritis-related pain numeric rating scale, patient global assessment, and a self-reported joint count.

Analysis

Data analyses were conducted in SAS (version 9.1, SAS Institute, Inc., Cary, North Carolina). Preference data derived from ACA (SMRT version 4.21, Sawtooth Software, Inc.) were imported into SAS and merged with the patient characteristics data set. In ACA, regression models are constructed for each individual based on individual respondents’ ratings to the survey questions. Utilities are calculated using a least squares updating algorithm. The final utility estimates reflect true least squares. We calculated the relative importance that respondents assigned to each attribute by dividing the range of utilities for each attribute by the sum of the ranges and multiplying by 100.

Market simulators are used to convert the raw utilities into preferences for specific options. In this study, treatment preferences for the status quo (defined by the following levels: unchanged joint pain and swelling, functional limitations, rate of disease progression, ability continue working, and no increased risk of adverse reactions) versus a biologic (defined by the following levels: 40% have improved pain and function, 30% have no further erosions,
60% are able to continue working, 20% risk an injection reaction, risk of tuberculosis = 5 in 10,000, extremely rare risk of neurologic disease) were generated using the first choice model, which assumes that the respondent chooses the product with the highest predicted utility.

The associations between subjects’ characteristics and preference for the status quo were tested in bivariate analyses using t test, Mann-Whitney test, or chi-square test as appropriate. We examined the correlation between subjective numeracy and the relative importance of each attribute. We then examined the association between subjective numeracy and preference for the status quo in a logistic regression model controlling for the covariates found to be significantly associated with status quo preference (P < 0.05). Race, education, and income were highly correlated; of these, race was included as a covariate in adjusted analyses because it was the variable most strongly associated with preference for the status quo. Age in years was entered into analyses as a continuous variable. Given the main effect of subjective numeracy on preferences for the status quo and the relation of older age to lower numeracy, we subsequently examined whether there was an interaction between subjective numeracy with age (both mean-centered) on preference for the status quo in a logistic regression model adjusting for the same covariates.

RESULTS

Of 205 eligible subjects, 156 agreed to participate. The majority were female, were white, and had at least some college education. Additional subject characteristics are presented in Table 1. Thirty-nine percent (n = 62) preferred the status quo alternative. Subjective numeracy was lower among subjects preferring the status quo compared with those preferring to change treatment (x[s] = 3.8 [1.4] v. 4.5 [1.1], P < 0.001). Subjects with higher subjective numeracy assigned more importance to slowing joint damage and less importance to risks (infection, tuberculosis, and neurologic disease) compared with those with lower subjective numeracy (Table 2). The associations between subjective numeracy and preference for the status quo remained significant in a regression model including covariates found to be significantly associated with the dependent variable in bivariate analyses (Table 3).

Age modified the effect of subjective numeracy on preference for the status quo (P = 0.04 for interaction after adjustment for age, subjective numeracy, and covariates) (Table 4). Among subjects younger than 65 years (n = 114), mean subjective numeracy was lower among those preferring the status quo compared with those preferring a treatment change (x[s] = 3.7 [1.3] v. 4.7 [1.1], P < 0.001). The association between subjective numeracy and preference for the status quo among younger subjects remained significant after we controlled for employment, race, and biologic use (adjusted odds ratio [95% confidence interval] = 0.64 [0.43–0.94], P = 0.02). In contrast, among older adults (n = 42), we found no difference in mean subjective numeracy among subjects preferring the status quo versus treatment change (x[s] = 3.9 [1.6] v. 4.0 [0.9], P = 0.8]). To facilitate interpretation of the interaction, the predicted probabilities

### Table 1  Subject Characteristics and Their Relation to Preferences for Status Quo versus Treatment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Prefer Status Quo</th>
<th>Prefer New Treatment</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%)</td>
<td>156</td>
<td>62 (39.7)</td>
<td>94 (60.3)</td>
<td></td>
</tr>
<tr>
<td>Mean subjective numeracy (s)</td>
<td>4.2 (1.3)</td>
<td>3.8 (1.4)</td>
<td>4.5 (1.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean age (s)</td>
<td>58.8 (12.9)</td>
<td>61.0 (13.5)</td>
<td>57.3 (12.4)</td>
<td>0.1</td>
</tr>
<tr>
<td>Female, n (%)</td>
<td>133 (85.3)</td>
<td>54 (87.1)</td>
<td>79 (84.0)</td>
<td>0.6</td>
</tr>
<tr>
<td>Hispanic, n (%)</td>
<td>12 (7.7)</td>
<td>4 (0.1)</td>
<td>8 (8.5)</td>
<td>0.7</td>
</tr>
<tr>
<td>Black, n (%)</td>
<td>27 (17.3)</td>
<td>19 (30.7)</td>
<td>8 (8.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Married, n (%)</td>
<td>96 (61.5)</td>
<td>33 (53.2)</td>
<td>63 (67.0)</td>
<td>0.08</td>
</tr>
<tr>
<td>College educated, n (%)</td>
<td>109 (69.9)</td>
<td>36 (58.1)</td>
<td>73 (77.7)</td>
<td>0.01</td>
</tr>
<tr>
<td>Employed, n (%)</td>
<td>74 (47.4)</td>
<td>22 (35.5)</td>
<td>52 (55.3)</td>
<td>0.015</td>
</tr>
<tr>
<td>Annual income &lt;$40,000, n (%)</td>
<td>53 (34.4)</td>
<td>29 (47.5)</td>
<td>24 (25.8)</td>
<td>0.01</td>
</tr>
<tr>
<td>Current biologic, n (%)</td>
<td>75 (48.1)</td>
<td>23 (37.1)</td>
<td>52 (55.3)</td>
<td>0.03</td>
</tr>
<tr>
<td>Median duration of disease (IQR)</td>
<td>9 (15)</td>
<td>12.4 (1.5)</td>
<td>12.3 (1.3)</td>
<td>0.7</td>
</tr>
<tr>
<td>Median disease activity (IQR)</td>
<td>14.8 (7.8)</td>
<td>3.6 (0.2)</td>
<td>3.4 (0.2)</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Note: IQR = interquartile range.
a. Possible range = 0–40.
The predicted probabilities were calculated based on ages that were 1 standard deviation above and below the mean (ages = 45.9 and 71.7 years, respectively) and subjective numeracy scores that were also ±1 standard deviation from the mean (scores = 3.0 and 5.5, respectively, on the 1–6 scale). Younger, more numerate adults were the most likely to prefer a treatment change compared with less numerate younger adults and older adults, who regardless of subjective numeracy were more likely to prefer the status quo.

### DISCUSSION

Preference to maintain the status quo (or clinical inertia) has important clinical consequences in RA because reluctance to change treatment likely increases the risk of morbidity and long-term disability. The results of this study suggest that preference for the status quo is stronger among younger subjects who have lower subjective numeracy and among older subjects regardless of subjective numeracy. Previous studies have demonstrated that less numerate individuals tend to perceive more risk, opt out of having risky procedures more frequently, and choose less risky options compared with the
The data demonstrating that highly numerate subjects rated the risks of treatment as lower than those lower in numeracy are consistent with this literature. However, to the best of our knowledge, this is the first study to examine the relation between numeracy and status quo preferences and specifically to examine preference for a new treatment (with additional benefits and added risk of side effects) over remaining with the status quo (i.e., no additional benefit and no added risk of side effects) after controlling for relevant covariates. Since status quo choices may be due to loss aversion (i.e., the downside of losing what you currently have looms larger than the potential benefits of what you could gain), the present results are consistent with recent findings demonstrating that persons scoring lower on a related measure of numeric competence show greater risk aversion. We also found that the impact of subjective numeracy on preference for the status quo was modified by age. Specifically, a protective effect of subjective numeracy on preference for the status quo was observed in younger but not older adults. This may be due to changing motivations and abilities as individuals age that result in age-related increases in the preference to avoid making decisions and, thus, to choose status quo options.

Increased risk aversion has been noted among minorities, and race was therefore included as a covariate in this study. The impact of race on preference for the status quo was not attenuated by other sociodemographic characteristics examined in this study. This finding highlights the need for further research to understand the mechanisms by which race influences treatment preference.

Strengths of this study include examination of preferences using an approach that requires patients to make explicit tradeoffs between competing risks and benefits and is therefore not biased by familiarity or personal experience with specific medications. However, our study has limited generalizability given the single patient population studied. Our study population included a relatively small number of older adults; nevertheless, mean subjective numeracy was almost exactly the same among older adults preferring the status quo versus a treatment change, suggesting that the negative finding was not due to a lack of power. In addition, although subjective and objective numeracy are correlated, we cannot comment on the potential relationship between objective numeracy skills and preference for the status quo.

In summary, our results suggest that subjective numeracy is associated with younger, but not older, RA patients’ preference for the status quo. Our results add to the literature highlighting differences in decision-making processes by numeracy and by age.

NOTE

Dr. Fraenkel had full access to all the data and takes full responsibility for the integrity of the data and the accuracy of the analysis. Data will be made available to others under a data-sharing agreement that includes (1) a commitment to using the data for research purposes only, (2) a commitment to protecting the data by using appropriately secure computer technology, and (3) a commitment to destroying or returning the data after analyses are completed. Data sharing will occur after all outlined analyses, presentation, and publication of the findings of the proposed study have been completed.

REFERENCES