Defining Utility Values for Chorea Health States in Patients With Huntington's Disease

Daniel O. Claassen, MD, MS[1]; Debbie Goldschmidt, PhD[2]; Mo Zhou, PhD[3]; Sam Leo, PharmD[4]; Rinat Ribalov, BSc Pharm, MHA, MA[5]; Rajeev Ayyagari, PhD[3]

[1]Vanderbilt University Medical Center, Nashville, TN, USA; [2]Analysis Group, Inc., New York, NY, USA; [3]Analysis Group, Inc., Boston, MA, USA; [4]Teva Pharmaceuticals, Parsippany, NJ, USA; [5]Teva Pharmaceutical Industries Ltd., Petah Tikva, Israel.

Conclusions

- Significant decreases in utility values were seen as severity of chorea associated with Huntington's disease (HD) worsened, suggesting that participants recognize the negative impact of HD chorea on daily functioning and quality of life (QOL)
- These values can be leveraged for future cost-effectiveness analyses to better understand the value of treatments for HD chorea

Background

- HD is a neurodegenerative disorder characterized by a triad of motor, cognitive, and psychiatric symptoms[1,2]
  - Chorea, a prominent motor symptom of HD, may negatively affect patients' QOL by increasing the risk of injury, impeding daily function, and causing social isolation[3,4]
- Utility values measure preferences for different health states and reflect societal perceived disease severity
  - These values are used by decision makers to more accurately estimate treatment benefit
- While several existing studies have examined the utility of different stages of HD,[5-7] no studies to date have reported utility values specifically for HD chorea
- The current study measured utilities for health states according to the time tradeoff (TTO) method, which is widely used and has been shown to have less total bias than methods such as standard gamble (SG).[8-11] SG, an alternative method to estimate utility values, is associated with significant cognitive burden and has been shown to overestimate utilities[8-10]

Objective

- To estimate the impact on QOL of different severity levels of chorea associated with HD using utility values from the general population

Methods

Study Design

- HD chorea utility values were elicited from the United States general population using computer-assisted telephone interviews that included written vignettes describing 4 health states of varying levels of chorea severity with the same underlying HD severity
- Screening criteria included adults ≥18 years old without a diagnosis of HD
- A survey was developed to collect data on participants' basic demographics and preferences for health states of HD chorea to ensure responses were generalizable
  - Health states of chorea were defined by total maximal chorea scores and included severe, moderate/severe, moderate/mild, and mild
  - Vignettes were developed for each chorea health state and shown in table format; each vignette described 3 aspects of the health state (i.e., general symptoms of HD, movement symptoms of chorea, and impact of chorea on daily activities)
    - Vignettes were validated among 4 external licensed neurologists who have treated patients with HD for ≥5 years and treated ≥5 patients with HD over the last 12 months
- After reading each vignette, participants rated each health state of chorea using TTO questions and a visual analog scale (VAS)

Outcomes and Analyses

- The primary outcome was to estimate utilities using TTO, which were validated using utilities obtained from the VAS
- HD chorea utility values represent individual preferences for avoiding different levels of chorea severity and reflect the number of years of life an individual is willing to give up in order to live in full health
  - Utility values for TTO range from –1 (worse than death) to +1 (perfect health), with the smallest difference being 0.05
  - VAS ranges from 0 (worst imaginable health) to 100 (best imaginable health); ratings were divided by 100 to obtain utility values (rescaled 0 to 1)
- Participant characteristics were summarized descriptively
- Continuous variables were summarized using mean and standard deviation (SD); categorical variables were summarized using frequency and percentage
- All ratings by any participants with logical errors were censored from analyses due to potential response bias
  - Logical errors were defined as rating a more severe health state (e.g., HD with severe chorea) as better than a less severe health state (e.g., HD with moderate/severe chorea)

Results

Participants

- A total of 155 participants provided valid responses to all TTO and VAS questions
  - The distribution of age and sex in the main sample was representative of the United States general population
  - Overall, 36.8% of participants did not report any chronic conditions; depression (24.5%) was the most commonly reported chronic condition (**Table 1**)
  - According to participant responses, mean (SD) current health status was 0.79 (0.16), where a score of 1 represents best imaginable health

Table 1. Participant Characteristics

	Participants (n=155)
Age at survey date (years), mean (SD)	47 (18)
Sex, male, n (%)	75 (48.4)
Race, n (%)	
White or Caucasian	117 (75.5)
Black or African American	12 (7.7)
Asian	14 (9.0)
Multiracial	4 (2.6)
Other[a]	8 (5.2)
Region of residence, n (%)	
Northeast	44 (28.4)
Midwest	31 (20.0)
South	58 (37.4)
West	21 (13.5)
Employment status, n (%)	
Full-time	62 (40.0)
Part-time	6 (3.9)
Retired	32 (20.6)
Self-employed/homemaker	23 (14.8)
Unemployed	14 (9.0)
Disabled	8 (5.2)
Student	10 (6.5)
Total annual household income before taxes, n (%)	
<$20,000	17 (11.0)
$20,000 to $34,999	27 (17.4)
$35,000 to $49,999	18 (11.6)
$50,000 to $74,999	39 (25.2)
$75,000 to $99,999	18 (11.6)
$100,000 to $149,999	25 (16.1)
$150,000 to $199,999	9 (5.8)
≥$200,000	2 (1.3)
Highest education level, n (%)	
Less than high school	1 (0.6)
High school degree or equivalent (e.g., GED)	20 (12.9)
Some college or associate's degree	51 (32.9)
Bachelor's degree/college graduate	57 (36.8)
Advanced degree	26 (16.8)
Most common comorbidities (≥10%), n (%)	
None	57 (36.8)
Depression	38 (24.5)
Hypertension	36 (23.2)
Diabetes	21 (13.5)
Obesity	20 (12.9)
Asthma	17 (11.0)
Cancer	16 (10.3)
Other[b]	17 (11.0)
Participants' current health status (VAS), mean (SD)	0.79 (0.16)
Familiarity with HD,[c] n (%)	n=98
Never heard of it	14 (14.3)
A little bit (e.g., I've heard of it, but don't know much about it)	54 (55.1)
Somewhat (e.g., I've heard/read about it and know something about it)	25 (25.5)
Very (e.g., I've studied it and/or personally know somebody with HD)	5 (5.1)

SD, standard deviation; GED, general educational development; VAS, visual analog scale; HD, Huntington's disease.
[a]Includes other and Native Hawaiian or other Pacific Islander.
[b]Includes addictions, anxiety, bipolar disorder, carpal tunnel, Crohn's disease, dry macular degeneration, fibromyalgia, gastroesophageal reflux disease, high cholesterol, hypothyroidism, hypertension, migraine, Ménière's disease, osteoarthritis, panic disorder, seizure, and sleep apnea.
[c]The question about familiarity with HD was added to the survey after some participants had already responded; therefore, responses are not available for all participants.

Utility Values

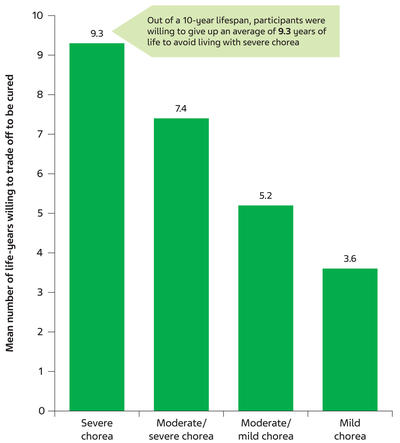
- The mean utilities for health states of HD chorea increased as severity of chorea decreased (**Table 2**)
  - Across severity levels of chorea, mean utility values were: 0.07 (severe), 0.26 (moderate/severe), 0.48 (moderate/mild), and 0.64 (mild)
  - Differences between each health state and its adjacent less severe health state were statistically significant (all $P<0.0001$)
- These utility values suggest that participants were willing to give up 9.3, 7.4, 5.2, and 3.6 years during a 10-year lifespan to avoid living with severe, moderate/severe, moderate/mild, and mild chorea, respectively (**Figure 1**)
- Utility increments from a more severe chorea health state to its adjacent less severe health state ranged from 0.16 to 0.22, suggesting that participants were willing to give up 1.6 to 2.2 years during a 10-year lifespan to avoid living with more severe chorea
- VAS utility values were found to be in the same range as TTO utility values
  - VAS utility increments from a more severe to less severe chorea health state ranged from 0.12 to 0.15, depending on the severity of chorea

Table 2. TTO and VAS Utility Values for the Primary Analysis (n=155)[a,b]

Severity of chorea	Utility values, mean (SD)	
	TTO	VAS
Severe	0.07 (0.52)	0.19 (0.17)
Moderate/severe	0.26 (0.50)	0.32 (0.19)
Moderate/mild	0.48 (0.47)	0.47 (0.20)
Mild	0.64 (0.41)	0.59 (0.20)

TTO, time tradeoff; VAS, visual analog scale; SD, standard deviation.
[a]Each chorea health state was compared to its adjacent health state and significant differences were found (all $P<0.0001$).
P values were obtained from paired t tests comparing each health state to the next less-severe health state.
[b]Participants who demonstrated a misunderstanding of the chorea health states by rating a more severe chorea health state better than a less severe chorea health state in the TTO have been removed from the sample.

Figure 1. TTO Results for the Primary Analysis (n=155)[a]



TTO, time tradeoff.
[a]Participants who demonstrated a misunderstanding of the chorea health states by rating a more severe chorea health state better than a less severe chorea health state in the TTO have been removed from the sample.

Discussion

Strengths

- Unlike previous studies of utility values for HD, this study focused on chorea associated with HD versus HD overall
- Additionally, this study accounted for important factors mediating QOL when estimating the utility of chorea associated with HD
- This study used TTO methods to elicit utility values, which may be associated with less bias than methods used in other studies (e.g., the SG method)
  - To address the limitations of TTO and validate utility values, this study used VAS in conjunction with TTO
- The participant sample was representative of the United States general population

Limitations

- Previous studies evaluated HD overall, which limits the comparability of results from this study
- While feedback from physicians was obtained on the vignettes used to inform participants from the general population about health states, there may have been discrepancies between participants' understanding of the health states and patients' real-life experiences
- This study was not able to assess utility values for all potential HD chorea symptoms and levels of severity

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References: **1.** Bates GP, et al. *Nat Rev Dis Primers*. 2015;1:15005. **2.** Ross CA, et al. *Nat Rev Neurol*. 2014;10(4):204-216. **3.** Thorley EM, et al. *Patient*. 2018;11(5):547-559. **4.** Ho AK, et al. *Clin Genet*. 2011;80(3):235-239. **5.** Hawton A, et al. *Eur J Health Econ*. 2019;20(9):1335-1347. **6.** van Walsem MR, et al. *Health Qual Life Outcomes*. 2017;15(1):6. **7.** Dorey J, et al. *J Mark Access Health Policy*. 2016;4. **8.** Bleichrodt H, Johannesson M. *J Health Econ*. 1997;16(2):155-175. **9.** Bleichrodt H. *Health Econ*. 2002;11(5):447-456. **10.** van Osch SM, et al. *Med Decis Making*. 2004;24(5):511-517. **11.** Wright DR, et al. *Pharmacoeconomics*. 2009;27(9):713-723.