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Bilateral Hallux Valgus: A Utility Outcome Score Assessment

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ABSTRACT

Hallux valgus is the most common forefoot problem in adults. Although it can cause considerable disability and affect the quality of life of those affected, many patients seek medical attention because of cosmetic concerns. Our aim was to objectively measure the perceived health burden of living with bilateral hallux valgus. Previously validated utility outcome measures, including the visual analog scale, time trade-off, and standard gamble tests, were used to quantify the health burden for single-eye blindness, double-eye blindness, and bilateral hallux valgus in 103 healthy subjects using an online survey. The Student *t* test and linear regression analysis were used for statistical analysis. The mean visual analog scale, time trade-off, and standard gamble scores for bilateral hallux valgus were 0.86 ± 1.6, 0.95 ± 0.5, and 0.95 ± 0.14, respectively. These were significantly greater than the utility scores for single-eye and double-eye blindness ($p < .05$). Age, gender, race, income, and education were not statistically significant independent predictors of the utility scores for hallux valgus. In conclusion, we have objectively demonstrated the effect of living with bilateral hallux valgus deformities. Our sample population reported being willing to undergo a procedure with a 5% mortality rate and sacrifice 1.8 years of life to attain perfect health and avoid the bilateral hallux valgus health state. Our findings will guide us in counseling our patients and understanding how they perceive their foot deformity.

Hallux valgus is the most common pathologic entity of the big toe, affecting about 28% of the population with a greater incidence seen in females in their third to fifth decade of life (1,2). Although the prevalence increases steadily with age, some studies have also reported a high incidence of hallux valgus in the juvenile and adolescent groups before skeletal maturity (3). Patients can present with pain over the medial eminence, cosmetic concerns, and problems wearing certain types of shoe wear (4). Furthermore, hallux valgus can be a disabling condition affecting a patient's quality of life and functional mobility (5,6). To the best of our knowledge, no previous studies have objectively investigated the effect of living with the physical appearance of hallux valgus.

Utility outcome scores are standardized measures designed to objectify the disease burden on an individual by assigning a value representing the relative quality of life experienced by the individual compared with a state of perfect health (7–9). Scores range from 0 (clinical death) to 1 (perfect health). Several validated measurement tools exist, and these utilities provide a method for translating qualitative descriptions of an individual's health state to quantitative values that can be used for analysis and comparisons in health economics and resource allocation (7,9). The primary aim of the present study was to measure the perceived burden of hallux valgus among the general population using 3 previously validated utility outcomes scores: standard gamble (SG), time trade-off (TTO), and visual analog scale (VAS) (9–12). The secondary aim was to investigate whether age, gender, race, education, and income were independent predictors of the utility scores for bilateral hallux valgus deformity.

Materials and Methods

After receiving ethics approval for the study from our local institutional review board, an open enrollment internet-based website was created and hosted by McGill University to measure the utility scores for hallux valgus. The online survey was posted

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to online classified websites to recruit a sample from the general population. All prospective participants provided electronic consent before they participated in the present study. All the participants completed anonymous demographic questionnaires, health state questionnaires, and utility assessments for scenarios describing a patient with single-eye blindness, double-eye blindness, or hallux valgus. The inclusion of the single- and double-eye blindness scenarios was to familiarize the participants with the survey process and to assess their comprehension of the study objectives. Those who assigned a higher utility score (representing a health state closer to perfect health) to double-eye blindness than to single-eye blindness were excluded from the study. All participants were required to register with a valid electronic mail address, and repeat surveys from the same electronic mail address were excluded. A health-state scenario of bilateral hallux valgus was created based on expert opinion and included a photograph of a patient's feet with bilateral hallux valgus (Fig. 1).

The SG, VAS, and TTO were the 3 utility score measures used to assess for health-related quality of life. Using more than 1 utility score helped to minimize bias and overcome inherent weaknesses associated with the individual utility tests (7,13–15). The 3 utility outcome measures were performed in the same fashion for each of the 3 health states tested (single-eye blindness, double-eye blindness, and bilateral hallux valgus).

Regarding the score assessments for hallux valgus, the VAS component asked participants to visualize themselves as the patient in the provided scenario with the feet presented in Fig. 1 and to rate the perceived effect of this health state by providing a score between 0 (death) and 100 (perfect health). The VAS utility score for bilateral hallux valgus was then calculated using the formula: utility score = participant's score/100.

For the TTO, the participants were asked the number of years they would be willing to trade to have the health state in question corrected. Using a previously described algorithm, the individuals were asked to choose between living 36 more years of their life with bilateral hallux valgus versus trading off some of those years of life to live in perfect health (no hallux valgus) (7). An indifference point representing the maximum amount of life years an individual would sacrifice to avoid bilateral hallux valgus was identified by using ≤6 iterations of a bisecting algorithm that would present varying amounts of life-years lost to the participant until an acceptable trade-off was reached. The score was then calculated using the formula: TTO utility score = (number of years living with hallux valgus − number of years traded at the indifference point)/number of years living with hallux valgus (7).

For the SG utility score, the participants had to choose between 2 options: to remain in the given health state (e.g., hallux valgus) or to gamble on a treatment with some probability of success (perfect health) and some probability of failure (death). The initial gamble was presented as a treatment with a 99% chance of perfect health but 1% chance of death. The participants were then offered treatment with an increasing chance of death in percentages until they reached their maximum level of risk. The bisecting algorithm was then used to further define the indifference point at which the participant would accept the gamble to avoid having bilateral hallux valgus. The SG utility score was determined using the formula: SG score = 1.00 − the probability of death at the point of indifference (16). At the end of the questionnaire, the participants were asked to rate their quality of life by generating a utility score for their current health state using the previously described TTO measure.

Statistical analysis was performed using Statistical Package for Social Sciences, version 20 (SPSS Inc., Chicago, IL). A paired *t* test was used to compare the mean utility scores. Furthermore, linear regression analysis was performed using age, race, gender, income, and education as independent factors of all 3 utility measures (SG, TTO, and VAS). A p value $< .05$ was considered statistically significant.

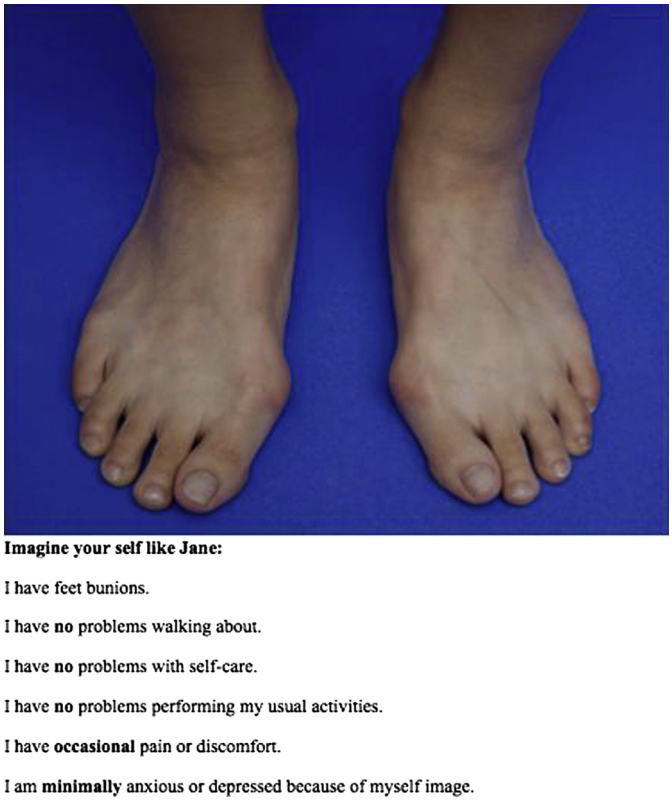

Fig. Image of bilateral hallux valgus. This image was presented, along with the clinical scenario, to all participants.

Results

A total of 131 participants voluntarily enrolled in the study through the website. Of the 131 patients, 28 (21.4%) were excluded, leaving 103 to be included in the analysis. Of the 103 included participants, most were female (n = 73; 70.9%) versus male (n = 23; 21.7%), with a mean age of 22.5 ± 5.6 years. The participants were predominantly white (n = 58; 54.6%). The remaining participant demographics are listed in Table 1.

All participants included in our study rated double-eye blindness lower in all 3 mean utility scores (VAS 0.33 ± 1.8; TTO, 0.62 ± 0.28; SG, 0.61 ± 0.26) compared with single-eye blindness (VAS, 0.63 ± 1.7; TTO, 0.84 ± 0.16; SG, 0.85 ± 0.16; $p < .0001$; Table 2). The mean VAS, TTO, and SG hallux valgus utility scores were 0.86 ± 1.6, 0.95 ± 0.5, and 0.95 ± 0.14, respectively. All 3 scores for hallux valgus were significantly greater than the utility scores for single-eye ($p < .0001$) and double-eye ($p < .0001$) blindness (Table 2). The participants rated their current quality of life (TTO, 0.97 ± 0.02) greater than that of the patient in the hallux valgus scenario (TTO, 0.95 ± 0.5; $p = .02$).

The mean bilateral hallux valgus utility scores for the SG (0.95 ± 0.14) and TTO (0.95 ± 0.5) denote that participants were willing to undergo a procedure with a 5% mortality rate and sacrifice 1.8 years of life to attain perfect health. Age, gender, race, income, and education were not statistically significant independent predictors of the utility scores for hallux valgus using logistic regression analysis ($p > .05$).

Table 1
Participant demographics (N = 103)

Variable	Value
Mean age (y)	22.5 ± 5.6
Gender	
Female	73 (70.9)
Male	23 (22.3)
Not reported	7 (6.8)
Race	
African-American	2 (1.9)
Asian	12 (11.7)
White	58 (56.3)
Hispanic	1 (1)
Other	8 (7.8)
Prefer not to answer	22 (21.3)
Education	
Some college	45 (43.7)
College graduate	19 (18.4)
Graduate or professional degree	9 (8.7)
Medical education	5 (4.9)
High school	2 (1.9)
Prefer not to answer	23 (22.3)
Income	
<$10,000	33 (32)
$10,000 to 25,000	12 (11.7)
$25,000 to 50,000	2 (1.9)
$50,000 to 100,000	3 (2.9)
>$100,000	0 (0)
Prefer not to answer	53 (51.5)

Data presented as mean ± standard deviation or n (%).