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Estimating Health State Utilities in Duchenne Muscular Dystrophy (DMD) Using the EQ-5D and Health Utilities Index (HUI)

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BACKGROUND

- Duchenne muscular dystrophy (DMD) progression is characterized by loss of ambulation and upper limb function, respiratory insufficiency, cardiomyopathy, and early mortality.[1] It profoundly impacts health-related quality of life (HRQoL)[2-5]
- Guidelines recommend that utility values, which are required inputs for economic evaluation, should be derived from generic instruments like the Health Utilities Index (HUI) or EuroQol 5 Dimension (EQ-5D)[6,7]
  - Utility values are scores ranging from 0 (equivalent to being dead) to 1 (perfect health) that reflect individual preferences for health states[8]
  - Only a small number of studies of utility values in DMD have been published[5,8,9]
  - Existing data predominantly characterize health states focused on ambulatory status, but fail to address other important aspects of function and HRQoL across the disease course[5,8,9]
- The purpose of this study was to estimate utility values for health states representing clinical and functional statuses observed among those with DMD

METHODS

- Individuals living with DMD in the US (or caregivers reporting on the patient's behalf), were recruited through PPMD to complete an online survey
- Individual utility values were estimated using the following:
  - EQ-5D (5-level version), which assesses mobility, self-care, usual activities, pain/discomfort, and anxiety/depression[6]
  - HUI, which consists of 2 complementary systems: the HUI-2 considers sensation, mobility, emotion, cognition, self-care, and pain; and the HUI-3 considers vision, hearing, speech, ambulation, dexterity, emotion, cognition, and pain[7]
- To classify current health state, patients (or caregivers) self-reported level of ambulation or upper limb function, use of respiratory support, and presence of cardiomyopathy (CM; **Figure**)
- Median (interquartile range [IQR]) EQ-5D and HUI utility values were calculated, stratified by patient health state and patient versus caregiver report[10-12]
- To evaluate attributes influencing utility scores for health states associated with DMD, median (IQR) attribute levels for EQ-5D, HUI-2, and HUI-3 utility values were estimated

RESULTS

- Of the 243 survey respondents, 177 (73%) were caregivers reporting on behalf of patients (**Table**)
  - 83 (34%) patients were ambulatory and 116 (48%) had preserved upper limb function
  - Mean (SD) patient age was 15.4 (8.0) years
- Median utility values (**Figure**):
  - Were highest for *ambulatory patients with preserved upper limb function without ventilation or CM,* ranging from 0.85 (caregiver, HUI-2 and HUI-3, n=59) to 0.96 (patient, HUI-2, n=10)
  - Were lowest for *non-ambulatory patients with loss of upper limb function, nighttime and daytime ventilation, and symptomatic CM*, ranging from –0.26 (caregiver, EQ-5D, n=1) to 0.38 (patient, HUI-2, n=3)
  - For the least progressed *non-ambulatory state (with preserved upper limb function, and without ventilation or CM),* ranged from 0.16 (patient, HUI-3, n=2) to 0.61 (patient, HUI-2, n=2)
- The attributes that had the greatest impact on utility values appeared to be mobility, self-care, and usual activities (EQ-5D); mobility and self-care (HUI-2); and ambulation and dexterity (HUI-3; data not shown)

Figure: Median (IQR) Caregiver-reported (left) and Patient-reported (right) EQ-5D, HUI-2, and HUI-3 Utility Values Per Health State

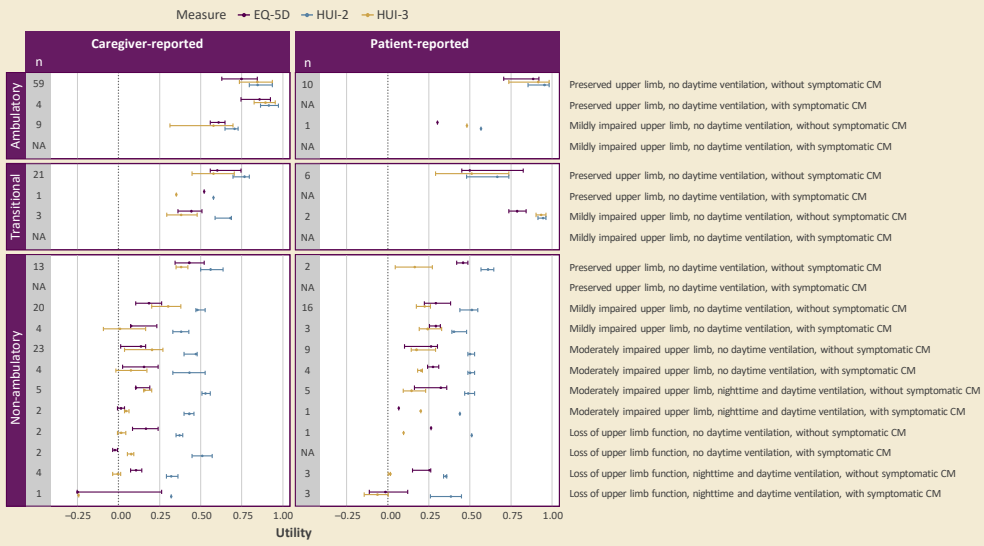

Table: Patient Demographics and Clinical Characteristics

Parameter	Caregiver-reported (n = 177)	Patient-reported (n = 66)
Patient age, years	13.3 (6.5)	21.1 (8.7)
Ambulatory status		
Ambulatory	72 (40.7)	11 (16.7)
Transitional	25 (14.1)	8 (12.1)
Non-ambulatory	80 (45.2)	47 (71.2)
Upper limb function		
Preserved	98 (55.4)	18 (27.3)
Mildly impaired	36 (20.3)	22 (33.3)
Moderately impaired	34 (19.2)	19 (28.8)
Loss of function	9 (5.1)	7 (10.6)
Ventilation use		
No ventilation	136 (76.8)	30 (45.5)
Nighttime ventilation	29 (16.4)	24 (36.4)
Daytime ventilation	12 (6.8)	12 (18.2)
Cardiomyopathy		
None/none identified	113 (63.8)	29 (43.9)
Asymptomatic	46 (26.0)	26 (39.4)
Symptomatic	18 (10.2)	11 (16.7)

Value are mean (SD) unless otherwise noted.

DISCUSSION AND CONCLUSIONS

- A relationship was observed between disease progression and health state utility in DMD, with lesser utility values observed among more severe health states
  - However, there was large variability between individuals in the same health state; potentially due to small sample sizes, but also due to heterogenous health experiences of individuals within a health state
- Utility values for non-ambulatory health states were variable and, for less severe health states, tended to be higher than other published estimates[8]
- HUI-2 utility values tended to be highest, whereas the HUI-3 produced the broadest range in utility values
  - This variability highlights the importance of considering the descriptive attributes of each instrument to understand the impact of the concepts and patient experiences being assessed
- Impaired ambulation, mobility, and dexterity (with attendant impacts on ability for self-care and participation in usual activities) were key drivers of HRQoL in DMD for all but the least progressed health states
  - Attributes such as pain, emotion, and cognition did not appear to have a linear relationship with disease severity
- Consistent with reports from other therapeutic areas,[13] patient-reported utility was higher than caregiver-reported utility for the same health state
- Limitations include that clinical status was self-reported, as well as the reliance on caregiver respondents reporting for younger individuals with DMD
- **These data, demonstrating that utility is lower for health states describing increasing symptom progression, augment scarce data on health state utility among people with DMD**
- **Describing how utility in DMD changes over time, as well as understanding the determinants of utility scores from larger samples will be important for better understanding the impact of DMD symptoms on patient HRQoL**

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