CO131

Health-Related Quality-of-Life in Duchenne Muscular Dystrophy: Insights from the DMD-QoL Instrument in a US Population

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Background

- Duchenne muscular dystrophy (DMD) is a progressive neuromuscular disease that negatively affects health-related quality-of-life (HRQoL)[1]
- Generic tools like the EuroQol's EQ-5D instrument, the Health Utilities Index (HUI), or the Child Health Questionnaire (CHQ) are commonly used to assess HRQoL impact but may not fully capture the unique challenges of living with DMD[2-5]
- The DMD-QoL (14-item) instrument was developed in the United Kingdom (UK) to address this gap, providing a validated, patient-reported outcome measure tailored for people with DMD[6]
- However, research from outside the UK is limited; as are data documenting changes in HRQoL related to changes in the clinical course of DMD over time
- Exploring how DMD-QOL scores vary over the course of disease progression offers a window into the evolving experience of individuals with DMD
- This investigation will help assess the measure's ability to reflect shifts in physical, emotional, and social aspects of life as the condition advances

Objectives

- To characterize HRQoL impact in a population living with DMD in the United States (US), as measured by the DMD-QoL instrument
- To evaluate changes in DMD-QoL scores over 36 months by health state

Methods

Study design and data collection

- Individuals with DMD aged 12 years or older, or caregivers of individuals with DMD, were recruited through Parent Project Muscular Dystrophy, a patient advocacy organization in the US
- Participants completed an online survey at baseline, which included a clinical questionnaire,[7] a series of demographic questions, and the DMD-QoL instrument[6]
  - The DMD-QoL assesses performance on physical function (3 items), social participation (3 items) and psychological impact (8 items); higher scores indicate better HRQoL and function
- Data from the clinical questionnaire were used to classify individuals into early ambulatory, late ambulatory, early non-ambulatory, and late non-ambulatory health states[7]
  - *Early ambulatory*: walk all day; may use a wheelchair or scooter for long distances; preserved upper limb function
  - *Late ambulatory*: use a wheelchair or scooter some of the time; preserved/mildly impaired upper limb function
  - *Early non-ambulatory*: non-ambulatory with preserved/mildly impaired upper limb function
  - *Late non-ambulatory*: non-ambulatory with moderately impaired or loss of upper limb function
- The 'baseline cohort' included all those who responded to the survey at baseline (173 caregivers and 63 patients); and the 'M36 cohort' included the subset of the baseline cohort who also completed the survey at the 36-month follow up (100 caregivers and 32 patients)

Analysis

- Demographic and clinical characteristics were summarized by respondent type (caregiver vs. patient)
- The DMD-QoL was scored according to the developer's guidance[8]
  - Total scores (range, 0-42) were calculated by summing responses across all 14 items; subscale scores were calculated for physical function, social participation, and psychological impact

DMD-QoL scores at baseline

- For the baseline cohort, mean (SD) total and subscale scores were estimated by baseline health state, separately for caregiver and patient reports
- Median scores and interquartile ranges (IQRs) by health state and respondent type were visualized using box plots

Change in DMD-QoL scores across health states and over time

- For the M36 cohort, changes in total and subscale scores over time were summarized using mean (standard deviation; SD) and median (quartile [Q]1, Q3), stratified by ambulatory status and respondent type
- A linear regression model was developed to estimate change in DMD-QoL at 36 months, according to baseline health state
  - Models considered baseline age, treatment, DMD-QoL score, and respondent type as covariates

Results

Baseline cohort

- For the baseline cohort, mean (SD) patient age was 13.2 (6.5) and 19.8 (6.1) years, in the caregiver- and patient-reported samples respectively
  - 23.1% (n=40) of the caregiver-reported sample and 52.4% (n=33) of the patient-reported sample used day or night ventilation at baseline
- The distribution of health states describing lower and upper limb function differed between the caregiver-reported and patient-reported samples: 41% (n=71) of the caregiver-reported sample were in the early ambulatory state at baseline, compared to 17.5% (n=11) of the patient-reported sample **(Table 1)**

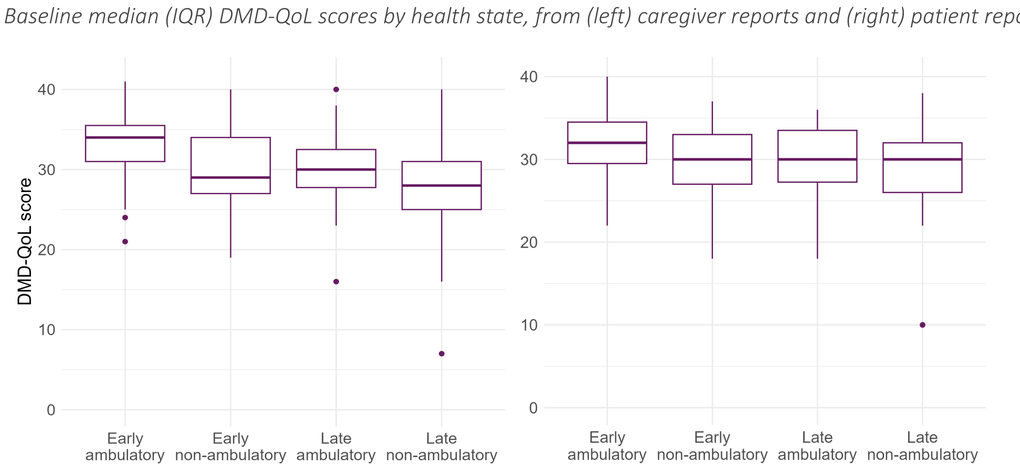
Table 1 *Baseline DMD-QoL scores by health state, baseline cohort*

DMD patient health state	Caregiver reports (n=173)		Patient reports (n=63)	
	n	Mean (SD) DMD-QOL score	n	Mean (SD)
Early ambulatory	71	33.3 (4.0)	11	31.8 (5.1)
Late ambulatory	24	30.0 (5.4)	8	29.4 (5.9)
Early non-ambulatory	37	29.9 (5.0)	21	29.6 (4.7)
Late non-ambulatory	41	27.0 (6.3)	23	28.9 (5.9)

Abbreviations: DMD-QoL, Duchenne muscular dystrophy quality of life (14 item tool); **SD,** standard deviation

- Based on data from both caregiver and patient reports, baseline DMD-QoL scores were lower with increasing disease severity **(Table 1)**
  - Unadjusted mean caregiver-reported scores ranged from 33.3 (SD=4.0; n=71) in the early ambulatory state to 27.0 (SD=6.3; n=1) in the late non-ambulatory state
  - Patient-reported scores showed a similar trend, decreasing from 31.8 (SD=5.1; n=11) in the early ambulatory state to 28.9 (SD=5.9; n=23) in the late non-ambulatory state
- For DMD-QOL subscale scores, physical function scores and to a lesser extent social participation scores were lower with increasingly severe health states; psychological function scores were relatively stable **(see Supplementary Materials)**
- Examination of boxplots demonstrated that across health states, DMD-QoL scores represented a limited range of the total instrument scores, with overlapping ranges between health states **(Figure 1)**

Figure 1 *Baseline median (IQR) DMD-QoL scores by health state, from (left) caregiver reports and (right) patient reports*



Abbreviations: DMD-QoL, Duchenne muscular dystrophy quality of life (14 item tool); **IQR,** interquartile range

Changes in DMD-QoL scores over 36 months of follow-up

- Among the M36 cohort, at baseline, DMD-QoL scores by health state were similar to those of the full baseline cohort
  - Mean caregiver-reported scores ranged from 33.1 (SD=3.5; n=46) in the early ambulatory state to 28.2 (SD=5.7; n=19) in the late non-ambulatory state
  - Patient-reported scores showed a similar trend, decreasing from 33.4 (SD=4.2; n=7) in the early ambulatory state to 29.2 (SD=5.0; n=13) in the late non-ambulatory state
- Over the 36-month period, patients progressed to more severe health states, marked by a notable decline in the number of individuals in the early ambulatory stage and a corresponding increase in the sample size within the early non-ambulatory health state **(Figure 2)**

Figure 2 *Transitions in health state from baseline to M36, M36 cohort*

	Caregiver reports				Patient reports			
	Ambulatory		Non-ambulatory		Ambulatory		Non-ambulatory	
Health state	Early	Late	Early	Late	Early	Late	Early	Late
Baseline n=100	45 (46%)	15 (15%)	21 (21%)	19(19%)				
Baseline n=32					7 (21.9%)	4 (12.5%)	8 (25%)	13 (40.6%)
M36 n =100	27 (27%)	13 (13%)	34 (34%)	26 (26%)				
M36 n=32					4 (12.5%)	3 (9.4%)	11 (34.4%)	14 (43.8%)

Abbreviations: M36, 36 month cohort

- Adjusted model analyses indicated no significant changes in DMD-QoL score over 36 months according to baseline health state, regardless of whether reports were provided by caregivers or patients **(Table 2)**

Table 2 *Least square mean estimates of changes in DMD-QoL scores over 36 months for caregiver and patient reports*

DMD patient health state at baseline	Change in DMD-QoL total score over 36 months		
	n	LS means estimate (95% CI)	p-value
Early ambulatory	52	-0.7 (-2.8, 1.3)	0.490
Late ambulatory	19	0.8 (-1.8, 3.5)	0.544
Early non-ambulatory	29	0.2 (-2.1, 2.5)	0.872
Late non-ambulatory	32	-0.4 (-2.6, 1.8)	0.727

Abbreviations: **CI,** confidence interval**; DMD-QoL**, Duchenne muscular dystrophy quality of life 14 item tool; **LS,** least square means

Discussion

- Published data on the DMD-QoL, a DMD-specific HRQoL measure that more broadly conceptualizes wellness and quality-of-life compared to traditional HRQoL measures, are few and limited to the UK
- In this longitudinal assessment of a large US cohort of individuals with DMD or their caregivers:
  - DMD-QoL total scores at baseline were lower for more severe health states; however, the range of scores across health states was very narrow given the wide span of physical abilities portrayed across health states
  - Additionally, scores did not obviously differentiate between successive health states
  - Total DMD-QoL scores did not show significant changes across health states over the 36-month period, by health state, despite the progressive decline in functional status of the sample
- The large sample size followed for 36 months, particularly for those in the late non-ambulatory state, is a key strength of this study; limitations include reliance on self-reported clinical status and the potential impact of attrition bias on the generalizability of the study sample at 36 months

Conclusion

- DMD-QoL scores suggest HRQoL in DMD remains relatively stable despite disease progression
- These findings contribute to understanding the sensitivity of the DMD-QoL measure for tracking disease impact over time

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