

EQ-5D Utility According to Patient Self-reported Health on the Visual Analogue Scale in Duchenne Muscular Dystrophy

Ivana F Audhya;¹ Shelagh M Szabo;² Evelyn Griffin;² David Feeny;³ Daniel C Malone;⁴ Peter Neumann;⁵ Susan T Iannaccone;⁶ Pramoda Jayasinghe;² Katherine L Gooch¹

¹Sarepta Therapeutics, Inc., Cambridge, MA; ²Broadstreet HEOR, Vancouver, BC; ³McMaster University, Hamilton, ON; ⁴The University of Utah, Salt Lake City, UT; ⁵Tufts Medical Center, Boston, MA; ⁶The University of Texas Southwestern, Dallas, TX USA

Background

- Duchenne muscular dystrophy (DMD) is a rare, X-linked, monogenic, neuromuscular disease characterized by progressive loss of skeletal muscle, pulmonary and cardiac function, with evidence of muscle damage and myopathy observable from birth¹⁻³
 - Patients with DMD typically experience loss of ambulation in late childhood, cardiomyopathy in late adolescence, and premature mortality
 - These clinical effects result in substantial health-related quality-of-life (HRQoL) impacts^{4,5}
 - In studies of HRQoL in DMD, individuals are often subgrouped according to levels of lower (i.e. 'early' or 'late ambulatory' phase) and upper limb (i.e. 'early' or 'late non-ambulatory' phase) function⁵
- Generic measures to document HRQoL impact include the EQ-5D which classifies health status using pre-specified dimensions; and the visual analogue scale (VAS) which provides a holistic assessment of self-rated health on a given day^{6,7}
- Although often reported together, the EQ-5D survey and VAS instruments focus on different aspects and provide different types of information
 - The relationship between EQ-5D utility and patient-reported health on the VAS has not been extensively examined for DMD⁸

Objectives

- To examine the relationship between EQ-5D utility and VAS scores, and variability in VAS score and utility values, in patients with DMD

Methods

Data collection

- Individuals with DMD were recruited through Parent Project Muscular Dystrophy (PPMD), a patient advocacy organization in the United States (US)
- Inclusion criteria were 1) age 12-40 years; 2) self-reported confirmed diagnosis of DMD; 3) living in the US; and 4) fluent in English and able to provide informed consent
- Participants completed a clinical questionnaire, developed based on modifications of existing clinical assessments^{5,9-11} to document the current extent of DMD symptoms; responses were used to classify participants:
 - By ambulatory status (as ambulatory or non-ambulatory)
 - Into one of four high-level health states based on lower limb function (early or late ambulatory); and extent of upper limb involvement (none to mild [early non-ambulatory]; moderate to severe [late non-ambulatory])
- Participants also provided details of demographics, and completed the EQ-5D five-level (5L) and VAS measures

Analysis

- Demographic and clinical characteristics were summarized
- EQ-5D attribute scores were transformed using US-specific tariffs, which reflect perspectives of members of the general public on the HRQoL implications of health states,¹⁰ following the developer's instructions
- Median (interquartile range [IQR]) EQ-5D utility and VAS scores were compared by ambulatory status and high-level health state using Kruskal-Wallis tests
 - Median (Q1,Q3) scores per health state were visualized using forest plots
- The relationship between an individual's EQ-5D utility and VAS score was visualized with scatterplots; stratified by ambulatory status
 - Pearson's correlation was used to assess the relationship between EQ-5D utility and VAS scores, overall and by ambulatory status
- The range of EQ-5D scores was tabulated per VAS score quartile and visualized

Results

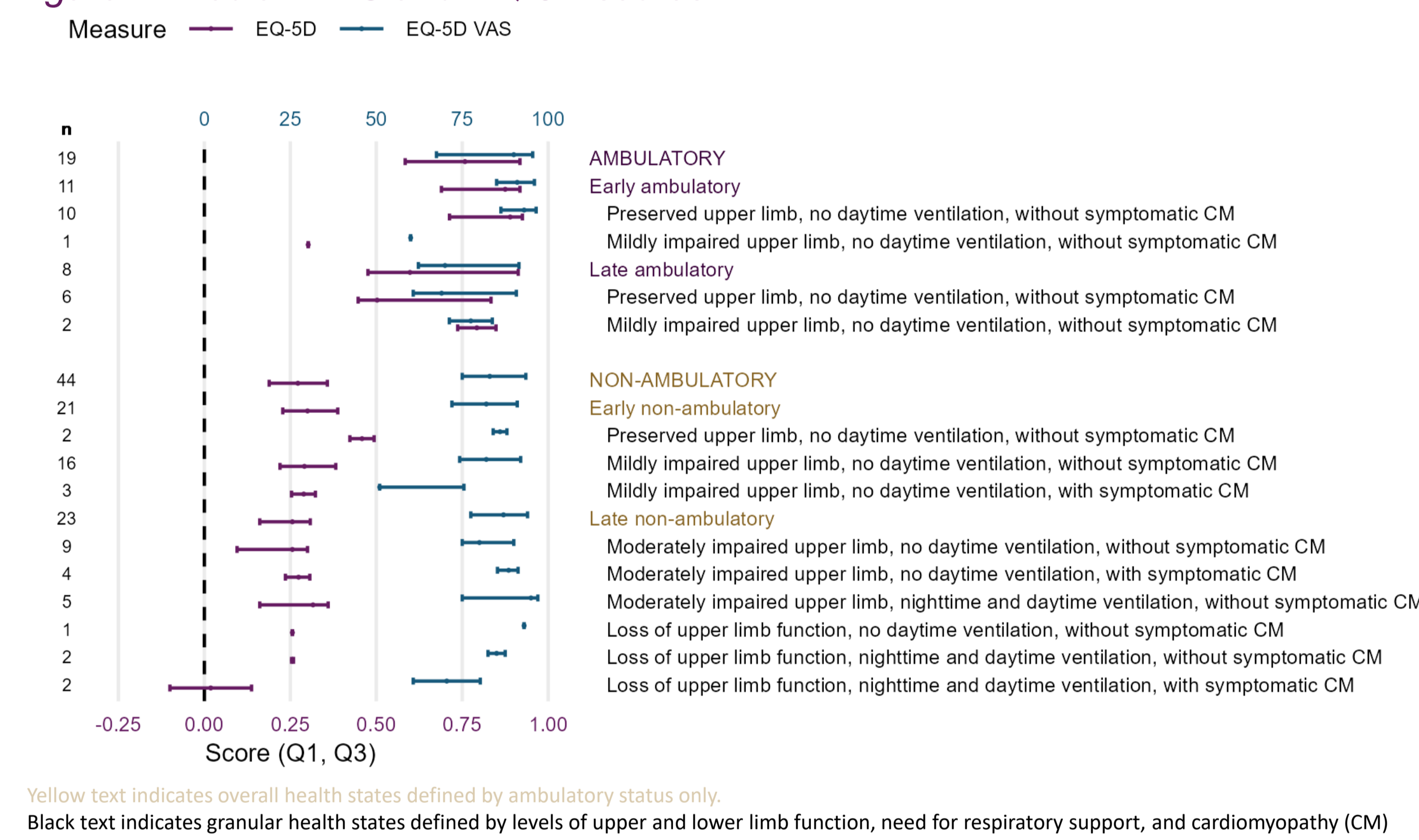
Patient characteristics

- Sixty-three individuals with DMD were included; mean (SD) age was 19.8 (6.1) years
- Eleven (17.5%) individuals were in the early ambulatory health state, 8 (12.7%) were late ambulatory, 21 (33.3%) were early non-ambulatory, and 23 (36.5%) were in the late non-ambulatory health state

EQ-5D utilities and VAS scores

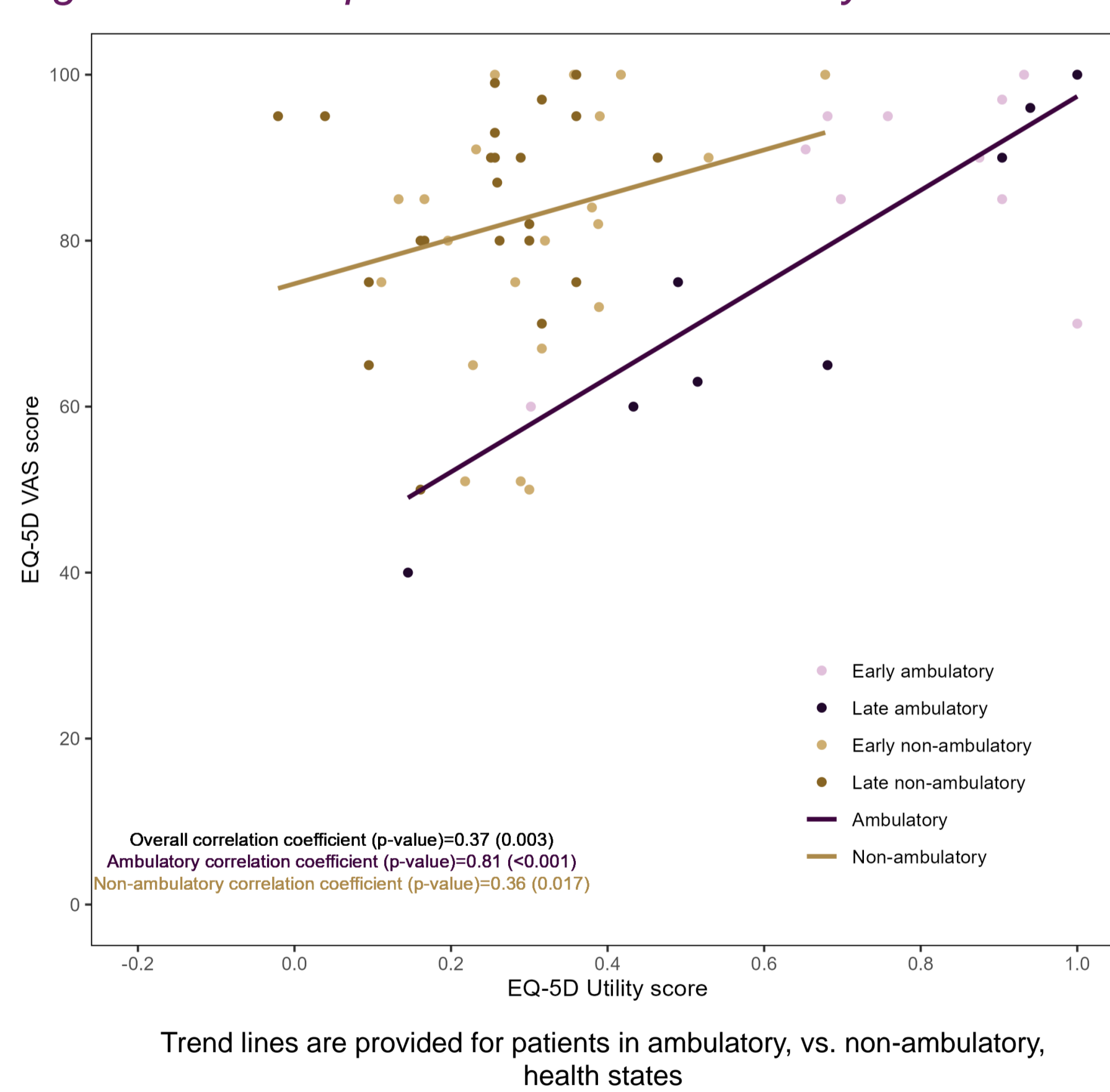
- Median (IQR) EQ-5D utility ranged from 0.88 (0.69-0.92) for the early ambulatory (n=11), to 0.26 (0.16-0.31) for the late non-ambulatory (n=23) health state (Figure 1)
 - A significant difference in EQ-5D utility was observed by ambulatory status ($p<0.001$) and health state ($p<0.001$)
- Median VAS scores by health state demonstrated a more restricted range; from 91 (85-96) for the early ambulatory, to 70 (62.3-91.5) for the late ambulatory, health state (Figure 1)
 - Median VAS scores did not differ significantly by ambulatory status ($p=0.663$) or health state ($p=0.313$)

Figure 1: Median VAS and EQ-5D scores



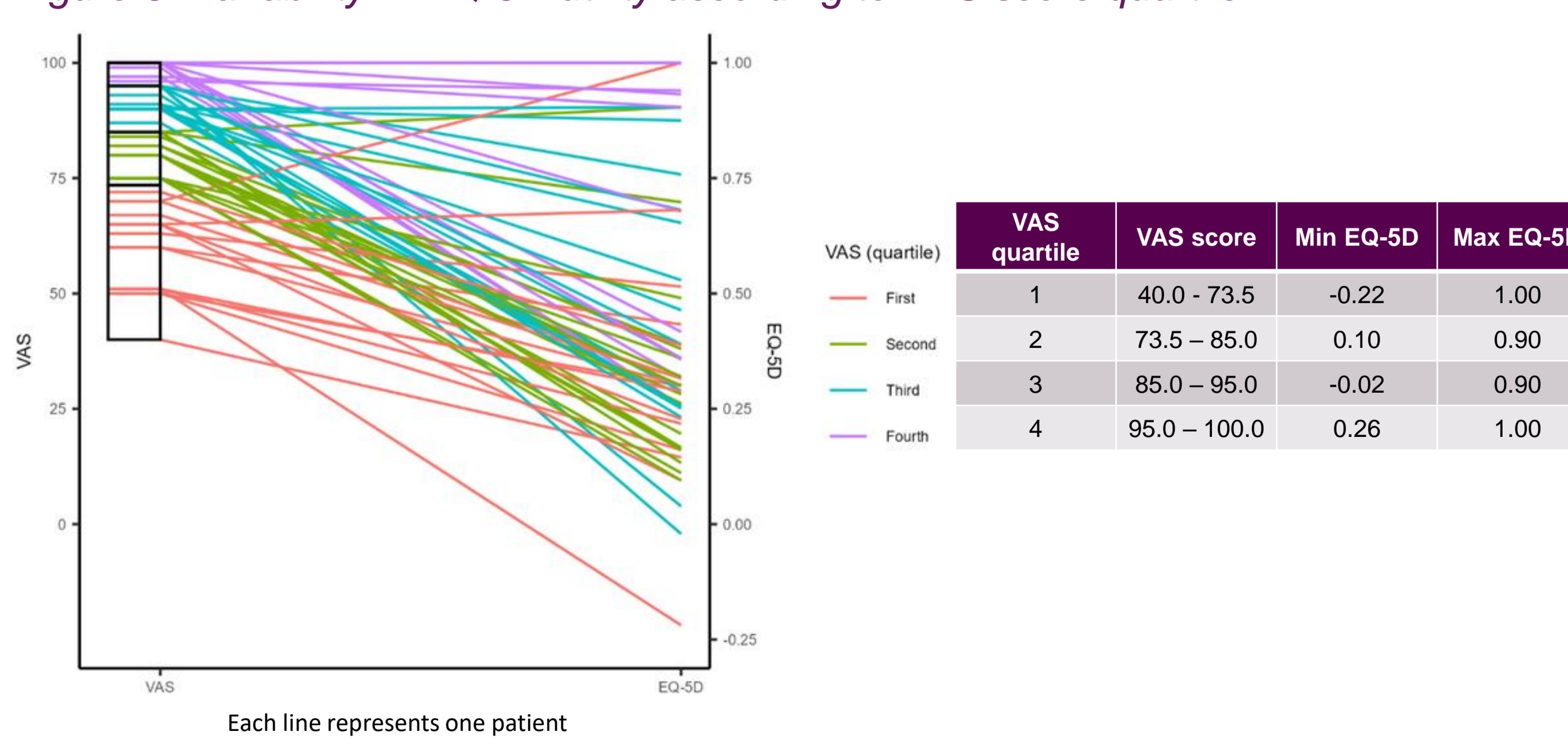
Yellow text indicates overall health states defined by ambulatory status only
Black text indicates granular health states defined by levels of upper and lower limb function, need for respiratory support, and cardiomyopathy (CM)

Figure 2: Scatterplot of VAS x EQ-5D utility scores



- A correlation of $r=0.37$ was observed between VAS and utility scores overall ($p=0.003$). The correlation was $r=0.81$ for ambulatory ($p<0.001$), and $r=0.36$ for non-ambulatory ($p=0.017$), patients (Figure 2)
- Ranges of utility per VAS quartile showed large variability (Figure 3)
 - For example, individuals in the best VAS score quartile (95-100) could have utility values between 0.26 and 1.00

Figure 3: Variability in EQ-5D utility according to VAS score quartile



Acknowledgements: The authors would like to thank Parent Project Muscular Dystrophy (PPMD) for assisting with recruitment for this study.

Disclosures: This study was funded by Sarepta Therapeutics Inc. IFA and KLG are employees of Sarepta Therapeutics Inc and may own stock/options. SMS, EG and PJ are employees of Broadstreet HEOR, which received funds from Sarepta Therapeutics to conduct this study. DF, PN, and DCM received consulting fees related to this work. STI has received research funding or consulting fees from Avexis, Biogen, Fibrogen, Mallinkrodt, Regeneron, Sarepta, Scholar Rock, PTC Therapeutics, Pfizer, MDA, CureSMA, NIH, Genentech-Roche, and BCBS.

Key Findings

- In DMD, the EQ-5D and VAS provide markedly different ratings of patient reported health status, with divergences being greater with declining ambulatory function
- A better understanding of how these two measures relate, and what drives more pronounced differences between the two measures, may have implications for interpreting utility values derived by general public tariffs

Conclusions

- The EQ-5D and VAS are recommended to be used together, to gain a comprehensive view of a person's HRQoL and wellbeing¹³
- While the scores on the measures use different scales, prior research has noted that among samples of the general public, health state-specific EQ-5D utility values have tended to be 'higher' than VAS scores
 - This is also true of those with chronic diseases¹⁴⁻¹⁶
- In contrast, in the present study, for individuals with DMD EQ-5D utility values tended to be 'lower' than VAS scores, with greater differences observed between the measures in non-ambulatory patients
 - The current study extends on a previous study reporting that VAS scores in DMD were 'consistently higher' than EQ-5D utility scores; drivers of this relationship were not extensively investigated⁸
- In the present study, while correlations between EQ-5D utility and VAS scores were strong for those ambulatory, the correlation for those in non-ambulatory states was much weaker
 - This highlights differences in perspectives on HRQoL implications of the non-ambulatory health state, between members of the general population and individuals with DMD
- These findings also point to the effect of adaptation on subjective scaling; the differences between EQ-5D and VAS scores of non-ambulatory patients indicate that patients' overall HRQoL may be higher than EQ-5D scores might suggest
- Limitations include that:
 - Data on clinical status used to assign health states were self-reported
 - There are many factors that could impact health status within a health state that are difficult to quantify; including access to resources, family support, features of the built environment, and personal and psychosocial characteristics of patients and their family members¹⁷
- Continued evaluation to understand what dimensions captured within utility measures have the most substantive impacts on overall health, as perceived by the VAS, would enhance the understanding patients' perspectives on how they are affected by DMD.

References

- Bushby K et al. *Lancet Neurol*. 2010;9:77-93; 2. Evans et al. *Fetal Diagn Ther*. 1995;10:71-75; 3. Min et al. *Annu Rev Med*. 2019;70:239-255; 4. Abbott et al. *Child Care Pract*. 2015;21:67-77; 5. Landfeldt et al. *Dev Med Child Neurol*. 2016;58:508-515; 6. Devlin et al. *Methods for Analysing and Reporting EQ-5D Data* [Internet]. 2020; 7. EuroQol Research Foundation. *EQ-5D-5L User Guide*, 2019. In: Available from: <https://euroqol.org/publications/user-guides/>; 8. Crossnohere et al. *MDM*. 2021;41(2):209-221; 9. Lowes L et al., *Wexner Research Institute*. 2019; 10. Pickard et al. *Value Health*. 2019;22(8):931-941; 11. Mayhew AG et al., *Dev Med Child Neurol*. 2020;62:633-9; 12. Audhya et al. *Value in Health*. 2022; 25; 13. Delvin. *EQ-VAS* an important and under-used element of the EQ-5D. Available from: <https://www.ohr.org/news/eq-vas-important-and-under-used-element-eq-5d/>; 14. Zhou et al. *Qual Life Res*. 2018;27:2799-2814; 15. Xu et al. *Health Qual Life Outcomes*. 2024;22:2; 16. Whynes et al. *Health Qual Life Outcomes*. 2008;6:94; 17. Bever et al. *Adv Ther*. 2024; 41:2460-2476.

SCAN THE QR CODE

The QR code is intended to provide scientific information for individual reference, and the information should not be altered or reproduced in any way.



Presented at
ISPOR EU;
November 17-20, 2024; Barcelona, Spain