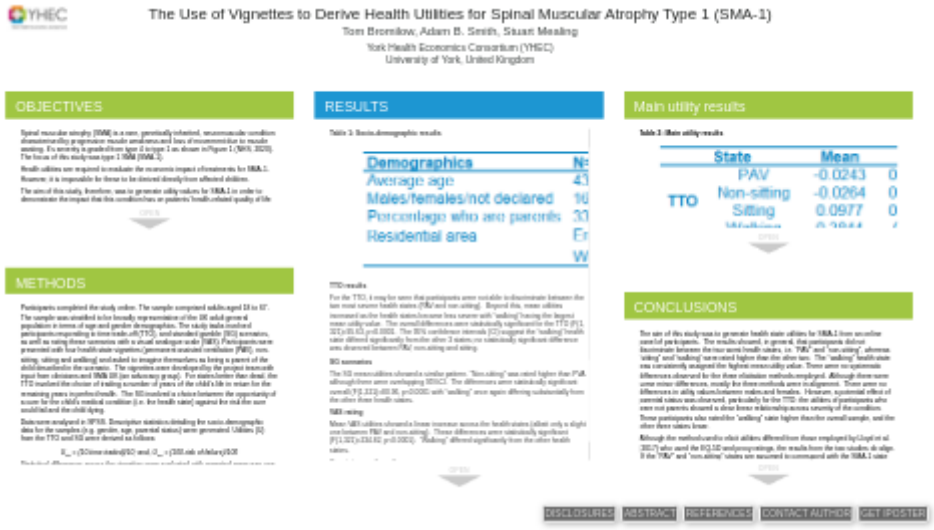
The Use of Vignettes to Derive Health Utilities for Spinal Muscular Atrophy Type 1 (SMA-1)



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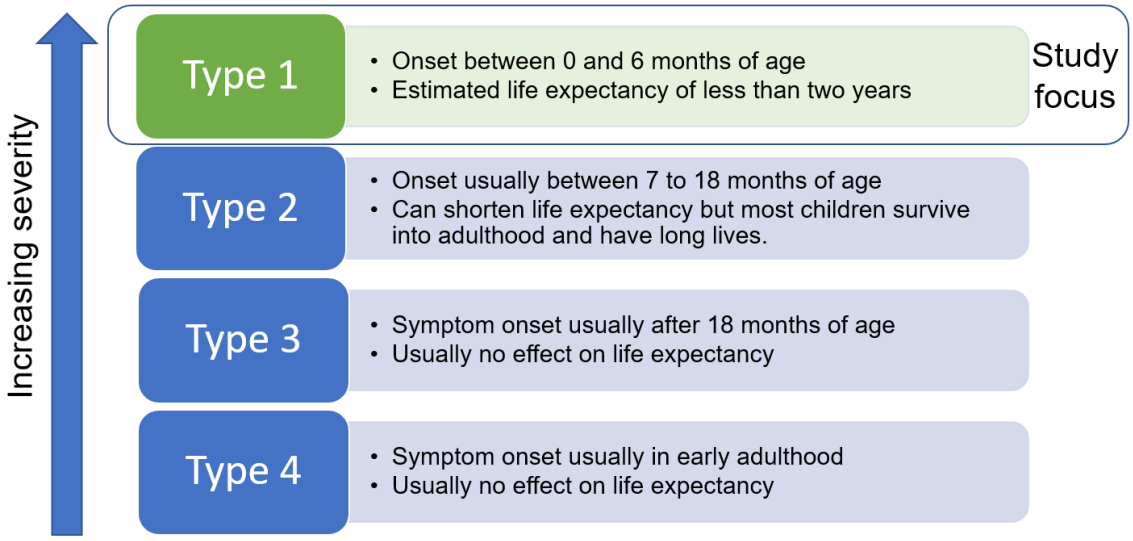
OBJECTIVES

Spinal muscular atrophy (SMA) is a rare, genetically inherited, neuromuscular condition characterised by progressive muscle weakness and loss of movement due to muscle wasting. It's severity is graded from type 4 to type 1 as shown in Figure 1 (NHS, 2020). The focus of this study was type 1 SMA (SMA-1).

Health utilities are required to evaluate the economic impact of treatments for SMA-1. However, it is impossible for these to be derived directly from affected children.

The aim of this study, therefore, was to generate utility values for SMA-1 in order to demonstrate the impact that this condition has on patients' health-related quality of life and for use in economic cost-utility analyses.

Figure 1: SMA severity grading



METHODS

Participants completed the study online. The sample comprised adults aged 18 to 67. The sample was stratified to be broadly representative of the UK adult general population in terms of age and gender demographics. The study tasks involved participants responding to time trade-off (TTO), and standard gamble (SG) scenarios, as well as rating these scenarios with a visual analogue scale (VAS). Participants were presented with four health state vignettes (permanent assisted ventilation (PAV), non-sitting, sitting and walking) and asked to imagine themselves as being a parent of the child described in the scenario. The vignettes were developed by the project team with input from clinicians and SMA UK (an advocacy group). For states better than dead, the TTO involved the choice of trading a number of years of the child's life in return for the remaining years in perfect health. The SG involved a choice between the opportunity of a cure for the child's medical condition (i.e. the health state) against the risk the cure could fail and the child dying.

Data were analysed in SPSS. Descriptive statistics detailing the socio-demographic data for the samples (e.g. gender, age, parental status) were generated. Utilities (U) from the TTO and SG were derived as follows:

$$U_{tto} = (10\text{-time traded})/10; \text{ and, } U_{sg} = (100\text{-risk of failure})/100$$

Statistical differences across the vignettes were evaluated with repeated measures one-way analysis of variance (ANOVA). Statistical significance was set at $p<0.05$.

RESULTS

Table 1: Socio-demographic results

Demographics	N=322
Average age	43.2 years (SD: 14.11; range: 18 – 65)
Males/females/not declared	161 (50%)/ 160 (49.7%)/ 1 (<1%)
Percentage who are parents	33.5%
Residential area	England: 274 (85.1%); Scotland: 32 (9.9%); Wales: 10 (3.1%); Northern Ireland: 6 (1.9%)

TTO results

For the TTO, it may be seen that participants were not able to discriminate between the two most severe health states (PAV and non-sitting). Beyond this, mean utilities increased as the health states became less severe with “walking” having the largest mean utility value. The overall differences were statistically significant for the TTO ($F(1, 321)=95.63$, $p<0.0001$. The 95% confidence intervals (CI) suggest the “walking” health state differed significantly from the other 3 states; no statistically significant difference was observed between PAV, non-sitting and sitting.

SG scenarios

The SG mean utilities showed a similar pattern. “Non-sitting” was rated higher than PVA although there were overlapping 95%CI. The differences were statistically significant overall ($F(1,321)=80.96$, $p<0.0001$ with “walking” once again differing substantially from the other three health states.

VAS rating

Mean VAS utilities showed a linear increase across the health states (albeit only a slight one between PAV and non-sitting). These differences were statistically significant ($F(1,321)=234.82$, $p<0.0001$). “Walking” differed significantly from the other health states.

Consistency of results

The results for participants who were not parents showed a clear linear relationship between health state severity and mean utilities; this pattern was not observed for those participants who were parents where the 95%CI indicated that there was no discrimination between the health states. For those participants who were not parents, “walking” remained the “best” health compared with the 3 others, as observed with the overall sample, although this was rated higher for non-parents. A similar pattern was observed for the mean SG utilities. However, the mean VAS utilities were in line with those observed for the overall sample: little or no discrimination between the “PAV” and “Non-sitting” health states, and a clear difference between “Walking” and other health states.

The mean health state utilities by gender followed those observed for the overall sample. There were no significant differences in mean utilities between males and females.

MAIN UTILITY RESULTS

Table 2: Main utility results

	State	Mean	SD	SE	95%CIL	95%CIH
TTO	PAV	-0.0243	0.6143	0.0342	-0.0914	0.0428
	Non-sitting	-0.0264	0.6429	0.0358	-0.0966	0.0438
	Sitting	0.0977	0.6282	0.035	0.0291	0.1664
	Walking	0.3844	0.567	0.0316	0.3225	0.4463
SG	PAV	0.0028	0.585	0.0326	-0.0611	0.0667
	Non-sitting	0.0139	0.5899	0.0329	-0.0505	0.0783
	Sitting	0.0946	0.5901	0.0329	0.0302	0.1591
	Walking	0.3782	0.5548	0.0309	0.3176	0.4388
VAS	PAV	-0.1193	0.5271	0.0294	-0.1769	-0.0618
	Non-sitting	-0.1011	0.5312	0.0296	-0.1591	-0.0431
	Sitting	0.0524	0.4585	0.0256	0.0023	0.1025
	Walking	0.3554	0.4092	0.0228	0.3107	0.4001

* Key: TTO – time trade-off; SG – standard gamble; VAS – visual analogue scale; PAV: permanent assisted ventilation; 95%CIL/H: 95% confidence interval lower / upper boundary.

CONCLUSIONS

The aim of this study was to generate health state utilities for SMA-1 from an online panel of participants. The results showed, in general, that participants did not discriminate between the two worst health states, i.e. “PAV” and “non-sitting”, whereas “sitting” and “walking” were rated higher than the other two. The “walking” health state was consistently assigned the highest mean utility value. There were no systematic differences observed for the three elicitation methods employed. Although there were some minor differences, mostly the three methods were in alignment. There were no differences in utility values between males and females. However, a potential effect of parental status was observed, particularly for the TTO: the utilities of participants who were not parents showed a clear linear relationship across severity of the condition. These participants also rated the “walking” state higher than the overall sample, and the other three states lower.

Although the method used to elicit utilities differed from those employed by Lloyd et al. (2017) who used the EQ-5D and proxy ratings, the results from the two studies do align. If the “PAV” and “non-sitting” states are assumed to correspond with the SMA-1 state described by Lloyd et al. (2019), in particular the baseline and sitting without support health states described in that study, then the mean utilities between the studies are quite close, particularly for the (overall) VAS elicitation process. This adds further weight along with the data checks to the quality of the data.

DISCLOSURES

This study was funded by Avexis. Avexis were not involved at any stage in the drafting of the manuscript or poster.

ABSTRACT

OBJECTIVES

Spinal muscular atrophy type I (SMA-I) is a rare genetic condition usually diagnosed before 6 months of age. Health utilities are required to evaluate the economic impact of treatments for SMA-I. However, it is impossible for these to be derived directly from affected children. The aim of this study was to derive SMA-I health utilities via vignettes.

METHODS

Participants were presented with 4 vignettes describing SMA-I health states that differed in levels of severity: 1. Permanent Assisted Ventilation (PAV); 2. Non-sitting, 3. Sitting and 4. Walking. Participants were asked to imagine themselves as parents to a child with SMA. For each vignette participants first determined whether the state was worse than death (WTD) using a visual analogue scale (VAS) (range: -100 to 100). Health state utilities were then captured using time trade-off (TTO) and standard gamble (SG). Task wording was varied depending on whether the state was rated WTD. The study was completed online with a representative sample of the UK adult population.

RESULTS

321 participants completed the study (age: 18-65; 49.7% females). Mean health state utilities for TTO were: -0.0243 [PAV, 95% confidence interval: -0.0914, 0.0428]; -0.0264 [Non-sitting, -0.0966, 0.0438]; 0.0977 [Sitting, 0.0291, 0.1664]; 0.3844 [Walking, 0.3225, 0.4463]. For the SG: 0.0028 [-0.0611, 0.0677], 0.0139 [-0.0505, 0.0783], 0.0946 [0.0302, 0.1591] and 0.3782 [0.3176, 0.4388]. The least severe health state (“Walking”) differed significantly from the other three states ($p<0.0001$). Mean utilities were not statistically significant for the worst 2 health states.

CONCLUSION

Mean health state utilities differed in line with severity of SMA-I. Although participants were not able to discriminate between the two worst health states, this, and the relatively low spread between mean utilities reflect the severity of SMA. These results contribute to a growing body of utility data for use in economic models of SMA treatments.

REFERENCES

Lloyd, A., Gallop, K., Thompson, R., Vaidya, S., & Teynor, M. (2017). Estimation Of The Health-Related Quality Of Life Benefits Of Treatment For Spinal Muscular Atropy (SMA). Value in Health, 20(9), A559. https://doi.org/10.1016/j.jval.2017.08.911

Lloyd AJ, Thompson R, Gallop K, Teynor M. (2019). Estimation Of The Quality Of Life Benefits Associated With Treatment For Spinal Muscular Atrophy. Clinicoecon Outcomes Res, 2019;11:615-622. https://doi.org/10.2147/CEOR.S214084

National Health Service. (2020). Spinal muscular atrophy. nhs.uk. Available from https://www.nhs.uk/conditions/spinal-muscular-atrophy-sma/types/ (https://www.nhs.uk/conditions/spinal-muscular-atrophy-sma/types/)