Development and Validation of a Patient Reported Outcome Measure for Giant Cell Arteritis

Mwidimi Ndosi[1], Celia Almeida[2], Jill Dawson[3], Emma Dures[2], Rosemary Greenwood[4], Catherine Guly[5], Sarah Mackie[6], Alison Bromhead[4], Steve Stern[4] and Joanna Robson[2], [1]University of the West of England, Bristol, Filton, United Kingdom, [2]UWE Bristol, Bristol, United Kingdom, [3]University of Oxford, Oxford, [4]University Hospitals Bristol and Weston NHS Foundation Trust, Bristol, United Kingdom, [5]University Hospitals Bristol and Weston NHS Foundation Trust, Bristol, [6]School of Medicine, University of Leeds, Leeds, United Kingdom

Citation information: Ndosi M, Almeida C, Dawson J, Dures E, Greenwood R, Guly C, Mackie S, Bromhead A, Stern S, Robson J. Development and Validation of a Patient Reported Outcome Measure for Giant Cell Arteritis [abstract]. *Arthritis Rheumatol.* 2021; 73 (suppl 10). https://acrabstracts.org/abstract/development-and-validation-of-a-patient-reported-outcome-measure-for-giant-cell-arteritis/

Background/Purpose: Giant cell arteritis (GCA) causes inflammation of the blood vessels of the head and neck and can cause visual loss and large vessel vasculitis. Patients suffer severe headaches, pain around the scalp and jaw and musculoskeletal symptoms. Treatment includes high dose glucocorticoids, to control symptoms and protect sight.

The aim of this study was to produce a validated disease-specific PROM for patients with GCA, to capture the impact of GCA and its treatment on health-related quality of life

Methods: This was a large cross-sectional survey including patients with clinician-confirmed GCA (cranial, visual loss and large vessel vasculitis) from the UK. Participants with a diagnosis date within the last three years OR flare of disease within the last year were recruited, to enrich the sample of participants with active disease. An underpinning qualitative study and cognitive testing developed 40 candidate items each with a 5-point Likert scale [1]. Patients completed this 40-item draft GCA-PROM alongside EQ5D-5L, CAT-PRO5 and self-report disease activity and steroid usage.

The statistical analysis aimed at determining the construct validity with Rasch models and factor analysis performed iteratively. Items were fitted to the Rasch model to determine its construct validity, reliability, unidimensionality and statistical sufficiency of the total score from the scale. Factor analysis was used to establishing factor structure. Item reduction decisions were be based on clinical importance, lack of fit to the Rasch model, and redundancy.

Further evidence of validity was tested by comparing the scores of the newly validated GCA-PROM (i) in participants who self-identify as having 'active disease' versus patients 'in remission' (known groups validity) (ii) with scores derived from EQ5D-5L and CAT-PRO5 (convergent validity).

Methods: This was a large cross-sectional survey including patients with clinician-confirmed GCA from the UK. Participants with a diagnosis date within the last three years OR participants who have had a flare of disease within the last year were recruited, to enrich the sample of participants with active disease. An underpinning qualitative study and cognitive testing developed 40 candidate items each with 5-point Likert scale [1]. Patients completed this 40-item draft GCA-PROM alongside EQ5D-5L, CAT-PRO5 and self-report disease activity and steroid usage.

Statistical analysis aimed at determining the construct validity with Rasch models and factor analysis performed iteratively. Items were fitted to the Rasch model to determine its construct validity, reliability, unidimensionality and statistical sufficiency of the total score from the scale. Factor analysis was used to establishing factor structure. Item reduction decisions were be based on clinical importance, lack of fit to the Rasch model, and redundancy detected during principal component analysis.

Further evidence of validity was tested by comparing the scores of the newly validated GCA-PROM (i) in participants who self-identify as having 'active disease' versus patients 'in remission' (known groups validity) (ii) with scores derived from EQ5D-5L and CAT-PRO5 (convergent validity).

Results: The validation sample comprised 426 patients, with a mean (SD) age of 74.2 (7.2), 327 (76%) had cranial GCA and 285 (67%) were female.

The initial analysis of the 40 items, resulted in a lack of fit to the Rasch model and led to the deletion of 10 items. Of the remaining items, 22/30 displayed disordered thresholds necessitating collapsing two categories (very mild and mild) resulting into a 4-response category structure which improved the thresholds.

Four factors (domains) were identified: Acute symptoms (8 items), Activities of daily living (7 items), Psychological (7 items) and participation (8 items). The four domains were analysed as 'super-items' and shown to fit the Rasch model. Table 1 presents item parameters for each of the 4 domains (non-significant Chi-Square probabilities indicate fit to the Rasch model).

Table 1: Fit statistics for each of the four domains GCA-PROM

Domain	Location	Standard error	Fit Residuals	Chi Square	DF	p-value
Acute symptoms (8 items)	0.270	0.017	2.807	3.346	6	0.764
Activities of daily living (7 items)	-0.047	0.010	-1.969	9.336	6	0.156
Psychological (7 items)	-0.208	0.013	-0.421	4.271	6	0.640
Participation (8 items)	-0.016	0.011	-1.828	8.267	6	0.219

The overall scale had an adequate fit to the Rasch model: X^2 = 25.219, DF=24, p=0.394 including reliability PSI=0.828. The raw-to-linear transformation scale was calibrated to enable parametric analyses if desired.

Each domain was shown to have known-groups validity and correlation with EQ5D-5L and CAT-PRO5 (Rs) ranging between 0.4.42 and 0.778 (Table 2).

The overall scale had an adequate fit to the Rasch model: X^2 = 25.219, DF=24, p=0.394 including reliability PSI=0.828. The raw-to-linear transformation scale was calibrated to enable parametric analyses if desired.

Each domain was shown to have known-groups validity and correlation with EQ5D-5L and CAT-PRO5 (Rs) ranging between 0.4.42 and 0.778 (Table 2)

Table 2: Convergent validity of the four domains with EQ5D-5L and CATPRO5

Correlation with EQ5D		
Domain	**Spearman's Correlation coefficient**	**p-value**
Acute symptoms	-0.631	<0.001
Activities of daily living	-0.729	<0.001
Psychological	-0.648	<0.001
Participation	-0.735	<0.001
Total score	-0.778	<0.001
Correlation with CAT-PRO5		
Acute symptoms	0.551	<0.001
Activities of daily living	0.557	<0.001
Psychological	0.442	<0.001
Participation	0.490	<0.001
Total score	0.556	<0.001

Conclusion: The final 30-item GCA-PROM with 4 domains is a robust measure of health-related quality of life in people with GCA. Further work is needed to confirm its use in clinical practice.

References

1. Robson JC, Almeida C, Dawson J, Bromhead A, Dures E, Guly C, Hoon E, Mackie S, Ndosi M, Pauling J, Hill C. Patient perceptions of health-related quality of life in giant cell arteritis; international development of a disease-specific Patient-Reported Outcome Measure. Rheumatology (Oxford). 2021:keab076. http://dx.doi.org/10.1093/rheumatology/keab076

Disclosures: M. Ndosi, None; **C. Almeida**, None; **J. Dawson**, None; **E. Dures**, None; **R. Greenwood**, None; **C. Guly**, None; **S. Mackie**, Roche, 2, Sanofi, 2, UK Medical Research Council (MRC) TARGET Partnership Grant (MR/N011775/1/MRC_/Medical Research Council/United Kingdom), 5, UK National Institute for Health Research (NIHR) Leeds Biomedical Research Centre, 5; **A. Bromhead**, None; **S. Stern**, None; **J. Robson**, None.