Mapping the Irritable Bowel Syndrome Quality of Life Measure to the EuroQol Five Dimensions Questionnaire in Patients With Irritable Bowel Syndrome With Diarrhoea

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BACKGROUND

- Elusobase is approved in the US and EU for the treatment of irritable bowel syndrome with diarrhoea, based on the results of two large, randomised, placebo-controlled Phase 3 trials.
- Quality of life (QOL) data were collected in a Phase 2 randomised, placebo-controlled trial of elusobase using the EuroQol five dimensions three-level questionnaire (EQ-5D) utility index and the Irritable Bowel Syndrome Quality of Life (IBS-QOL) measure, in the Phase 3 programme, only IBS-QOL was used.

OBJECTIVES

- To develop and validate a statistical model to predict UK EQ-5D utility scores using IBS-QOL scores and other demographic and symptom variables using data from the elusobase Phase 2 trial.

METHODS

STUDY DESIGN

- The Phase 2 data were randomly split 2:1 into a development dataset, used to fit the models and evaluate fit, and a validation dataset, used to validate model performance and responsiveness.
- Baseline demographic, symptom and IBS-QOL scores from Weeks 0, 4, 8 and 12 were analysed as predictors of EQ-5D scores. The following demographic and symptom variables from the Phase 2 trial were considered for inclusion in the algorithm: age, gender, average abdominal pain in the past 24 hours, where 0 is no pain and 10 is worst imaginable pain; Bristol Stool Form Scale (BSFS), where 1 is hard stool and 7 is watery diarrhoea; number of bowel movements; number of incontinence episodes; and number of urgency episodes.
- Symptom scores were averaged across the 7 days prior to each EQ-5D assessment, including the day of EQ-5D response.

MODELLING STRATEGY

- Four statistical approaches were compared (Table 1).
- Linear mixed model to predict EQ-5D total score.
- Item-level ordinal logit mixed model to predict each EQ-5D item score.
- Scale-level ordinal logit mixed model to predict the EQ-5D total score.
- Latent class mixture model to predict the EQ-5D total score.
- For each approach, IBS-QOL was evaluated by three types of scores:
  - Total score.
  - Subscales.
  - Items.
- Demographic and symptom scores were added to the best model within each approach (Table 1).

EVALUATION OF MODELS

- Model fit was evaluated in the development dataset using Akaike information criterion and Bayesian information criterion statistics.
- Model performance was evaluated in the validation dataset using root mean square error (RMSE), mean square error (MSE), and mean absolute error (MAE).
- In addition, mean observed scores were compared to mean predicted scores for different levels of symptom severity in the validation dataset.
- Responsiveness of the predicted EQ-5D scores vs observed scores was also evaluated in the validation dataset using the standardised response mean (SRM), the ratio of the mean change from baseline and the standard deviation (SD) of the change scores.

RESULTS

BASELINE DATA

- At baseline, the EQ-5D showed a trimodal distribution, with 8% of respondents having a maximum score.
- The development (n=519) and validation (n=273) datasets were similar.
- The EQ-5D item 1 = IBS-QOL items 4, 21, 22 and 23 + abdominal pain.
- Model fit was evaluated in the development dataset using Akaike information criterion (AIC) and Bayesian information criterion (BIC).
- For each approach, IBS-QOL was evaluated by three types of scores:
  - Scale-level ordinal logit mixed model to predict each EQ-5D item score.
  - Latent class mixture model to predict each EQ-5D item score.
- For each approach, IBS-QOL was evaluated by three types of scores:
  - Total score.
  - Subscales.
  - Items.

CONCLUSIONS

- The IBS-QOL data from the elusobase Phase 2 trial were successfully mapped to EQ-5D.
- The performance of this mapping approach is comparable with results from other published mapping functions, with comparable patterns of underperformance at the lower and upper end of the utility scale and magnitudes of accuracy measures.
- Sophisticated statistical models did not provide better prediction in these data, with the most successful model being a linear model.

- The use of mapping techniques to link the outcomes from different measures of health have become increasingly useful for conducting cost-utility analyses of new medicines when direct measurement is not available.

COMPARISON OF INDIVIDUAL MODEL APPROACHES

- Three models, 1) the linear, 2) the item-level ordinal logit and 3) the scale-level ordinal logit, the IBS-QOL item-based models performed slightly better than other models. For the latent class mixture approach, the IBS-QOL total score model performed the best.

COMPARISON OF BEST MODELS ACROSS MODEL TYPES

- Analysis of model performance indicated the models perform similarly, with only small differences between models (Figure 2).

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