



Patient Reported Outcome Measures (PROMs) in England

*A Methodology for applying casemix adjustment
Annex A: Coefficients for Groin Hernia Models*

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Groin Hernia – EQ-5D Index

Table A1 gives the variables that were statistically significant at the 95% level from the estimation step and their coefficients for predicting post-operative (Q2) scores for the Groin Hernia EQ-5D Index instrument¹.

Factor	Definition	Coefficient	Standard error
Q1 score	Patient's pre-operative questionnaire score	0.276	0.017
Age (squared)	Patient's age, squared	0.000008	0.000004
Sex: Female	Takes value 1 if patient is female, 0 if not	-0.019	0.004
Ethnicity: Asian	Takes value 1 if patient is of Asian ethnicity, 0 if not	-0.047	0.008
IMD score	The IMD (Deprivation) 2004 score for the area the patient lives in	-0.0005	0.00008
Assisted at Q1	Takes value 1 if patient was assisted in completing pre-operative questionnaire, 0 if not	0.008	0.004
Assisted at Q2	Takes value 1 if patient was assisted in completing post-operative questionnaire, 0 if not	-0.056	0.005
Living arrangements: Live alone	Takes value 1 if patient lives alone, 0 if not	-0.015	0.003
Disabled at Q1	Takes value 1 if patient considers themselves to have a disability, 0 if not	-0.147	0.003
HRG Code: F41	Takes value 1 if the main HRG assigned to patient's spell was F41 (v3.5), 0 if not	0.051	0.023
Previous Surgery: No	Takes value 1 if patient has not had previous surgery on groin, 0 if not	0.009	0.004
PRC: High blood pressure	Takes value 1 if patient has high blood pressure, 0 if not	0.008	0.003
PRC: Poor circulation	Takes value 1 if patient has poor circulation, 0 if not	-0.041	0.005
PRC: Lung disease	Takes value 1 if patient has lung disease, 0 if not	0.009	0.005
PRC: Diabetes	Takes value 1 if patient has diabetes, 0 if not	0.016	0.005
PRC: Nervous system diseases	Takes value 1 if patient has nervous system diseases, 0 if not	-0.043	0.01
PRC: Liver disease	Takes value 1 if patient has liver disease, 0 if not	0.036	0.015
PRC: Depression	Takes value 1 if patient has depression, 0 if not	-0.073	0.005
PRC: Arthritis	Takes value 1 if patient has arthritis, 0 if not	-0.046	0.003
Patient has 1 HESRC	Takes value 1 if patient has one HES-reported comorbidity, 0 if not	-0.020	0.007
Patient has 2 HESRC	Takes value 1 if patient has two HES-reported comorbidities, 0 if not	-0.054	0.016

¹ Note:
 PRC = Patient Reported Comorbidity
 HESRC = HES Reported Comorbidity

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Patient has 2 PRCs	Takes value 1 if patient has self-reported exactly two comorbidities, 0 if not	-0.015	0.004
Patient has 3 PRCs	Takes value 1 if patient has self-reported exactly three comorbidities, 0 if not	-0.035	0.007
Patient has 4 PRCs	Takes value 1 if patient has self-reported four or more comorbidities, 0 if not	-0.045	0.011
Day case patient	Takes value 1 if patient was a day case admission, 0 if not	0.014	0.002
Symptom period: >1 year	Takes value 1 if patient has experienced symptoms for greater than one year, 0 if not	-0.004	0.002
Constant term		0.655	0.161

Table A1: Descriptions and coefficients of variables included in the Groin Hernia EQ-5D Index statistical prediction model for PROMs case-mix adjustment

The predicted score is found by multiplying each coefficient by the patient's response, summing the values and adding the constant term i.e. the predicted Q2 score is calculated as:

$$\begin{aligned}
 Q2 \text{ predicted} = & 0.276 * (Q1 \text{ score}) + 0.000008 * (\text{Age squared}) - 0.019 * \\
 & (\text{Female}) - 0.047 * (\text{Asian}) - 0.0005 * (\text{IMD score}) + 0.008 * (\text{Assisted Q1}) - \\
 & 0.056 * (\text{Assisted Q2}) - 0.015 * (\text{Live alone}) - 0.147 * (\text{Disabled Q1}) + 0.051 * \\
 & (\text{HRG F41}) + 0.009 * (\text{No Previous Surgery}) + 0.008 * (\text{High BP}) - 0.041 * \\
 & (\text{Circulation}) + 0.009 * (\text{Lung Disease}) + 0.016 * (\text{Diabetes}) - 0.043 * (\text{Nervous} \\
 & \text{System}) + 0.036 * (\text{Liver Disease}) - 0.073 * (\text{Depression}) - 0.046 * (\text{Arthritis}) \\
 & - 0.020 * (1 \text{ HES CoM}) - 0.054 * (2 \text{ HES CoM}) - 0.015 * (2 \text{ Self CoM}) - 0.035 \\
 & * (3 \text{ Self CoM}) - 0.045 * (4+ \text{ Self CoM}) + 0.014 * (\text{Day case}) - 0.004 * \\
 & (\text{Symptom } >1 \text{ year}) + 0.657
 \end{aligned}$$

The key drivers in this model are:

- the patient's Q1 score,
- whether the patient was assisted in completing the post-operative questionnaire,
- the patient's disability status, and
- whether the patient has depression or arthritis.

All the other factors included in the table above have a statistically significant impact on predicting post-operative scores (at a 5% level), but they are less influential in driving Q2 scores.

Groin Hernia – EQ-5D VAS

Table A2 gives the variables that were statistically significant at the 95% level from the estimation step and their coefficients for predicting post-operative (Q2) scores for the Groin Hernia EQ-5D VAS instrument.

Factor	Definition	Coefficient	Standard error
Q1 score	Patient's pre-operative questionnaire score	-0.397	0.019
Q1 score (squared)	Patient's pre-operative questionnaire score, squared	0.006	0.0001
Age	Patient's age	-0.112	0.034
Age (squared)	Patient's age, squared	0.001	0.0003
Ethnicity: Asian	Takes value 1 if patient is of Asian ethnicity, 0 if not	-3.048	0.683
Ethnicity: Not given	Takes value 1 if patient's ethnicity is not given through HES, 0 if not	0.687	0.253
IMD (Deprivation)	The IMD (Deprivation) 2004 score for the area the patient lives in	-0.037	0.006
Assisted at Q1	Takes value 1 if patient was assisted in completing pre-operative questionnaire, 0 if not	0.605	0.283
Assisted at Q2	Takes value 1 if patient was assisted in completing post-operative questionnaire, 0 if not	-3.997	0.408
Living arrangements: Live alone	Takes value 1 if patient lives alone, 0 if not	-0.794	0.216
Disabled at Q1	Takes value 1 if patient considers themselves to have a disability, 0 if not	-8.000	0.268
Charlson Index of Comorbidities	Charlson Index of Comorbidities, based on comorbidities reported through HES	-1.164	0.446
PRC: Heart disease	Takes value 1 if patient has heart disease, 0 if not	-1.774	0.316
PRC: Poor circulation	Takes value 1 if patient has poor circulation, 0 if not	-3.008	0.438
PRC: Lung disease	Takes value 1 if patient has lung disease, 0 if not	-2.309	0.371
PRC: Nervous system diseases	Takes value 1 if patient has nervous system diseases, 0 if not	-4.482	0.773
PRC: Cancer	Takes value 1 if patient has (had) cancer, 0 if not	-1.902	0.400
PRC: Depression	Takes value 1 if patient has depression, 0 if not	-3.911	0.409
PRC: Arthritis	Takes value 1 if patient has arthritis, 0 if not	-2.361	0.259
Patient has 3 PRCs	Takes value 1 if patient has self-reported exactly three comorbidities, 0 if not	-1.094	0.552
Day case patient	Takes value 1 if patient was a day case admission, 0 if not	0.928	0.182
Symptom period >1 yr	Takes value 1 if patient has experienced symptoms for greater than one year, 0 if not	-0.567	0.162
Constant term		77.636	12.531

Table A2: Descriptions and coefficients of variables included in the Groin Hernia EQ-5D VAS statistical prediction model for PROMs case-mix adjustment

The predicted score is found by multiplying each coefficient by the patient's response, summing the values and adding the constant term i.e. the predicted Q2 score is calculated as:

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$Q2_{predicted} = -0.397 * (Q1 \text{ score}) + 0.006 * (Q1 \text{ score squared}) - 0.112 * (Age) + 0.001 * (Age \text{ squared}) - 3.048 * (Asian) + 0.687 * (Eth \text{ Not Given}) - 0.037 * (IMD \text{ score}) + 0.605 * (Assisted \text{ Q1}) - 3.997 * (Assisted \text{ Q2}) - 0.794 * (Live \text{ alone}) - 8.000 * (Disabled \text{ Q1}) - 1.164 * (Charlson) - 1.774 * (Heart \text{ Disease}) - 3.008 * (Circulation) - 2.309 * (Lung \text{ Disease}) - 4.482 * (Nervous \text{ System}) - 1.902 * (Cancer) - 3.911 * (Depression) - 2.361 * (Arthritis) - 1.094 * (3 \text{ Self CoM}) + 0.928 * (Day \text{ case}) - 0.567 * (Symptom >1 \text{ year}) + 77.636$

As with the Groin Hernia EQ-5D Index model, the key drivers in this model are:

- the patient's Q1 score,
- the patient's disability status,
- whether the patient was assisted in completing their post-operative questionnaire, and
- whether the patient has depression or arthritis.

All the other factors included in the table above have a statistically significant impact on predicting post-operative scores (at a 5% level), but they are less influential in driving Q2 scores.