

**Table a.** Oxford elbow score (OES) development: candidate questionnaire items with frequencies of patients' responses, together with reasons for excluding items from the final version

| Item options                                                                                                         | Response                   | Number (%) | Items excluded (X) from final version of OES, plus reason |
|----------------------------------------------------------------------------------------------------------------------|----------------------------|------------|-----------------------------------------------------------|
| Have you had difficulty lifting things in your home, such as putting out the rubbish, because of your elbow problem? | Impossible to do           | 8 (7)      |                                                           |
|                                                                                                                      | Extreme difficulty         | 27 (25)    |                                                           |
|                                                                                                                      | Moderate difficulty        | 35 (33)    |                                                           |
|                                                                                                                      | A little bit of difficulty | 16 (15)    |                                                           |
|                                                                                                                      | No difficulty              | 21 (20)    |                                                           |
| Have you had difficulty carrying bags of shopping, because of your elbow problem?                                    | Impossible to do           | 14 (13)    |                                                           |
|                                                                                                                      | Extreme difficulty         | 29 (27)    |                                                           |
|                                                                                                                      | Moderate difficulty        | 34 (32)    |                                                           |
|                                                                                                                      | A little bit of difficulty | 18 (17)    |                                                           |
|                                                                                                                      | No difficulty              | 12 (11)    |                                                           |
| Have you had difficulty washing yourself all over, because of your elbow problem?                                    | Impossible to do           | 6 (6)      |                                                           |
|                                                                                                                      | Extreme difficulty         | 15 (14)    |                                                           |
|                                                                                                                      | Moderate difficulty        | 28 (26)    |                                                           |
|                                                                                                                      | A little bit of difficulty | 28 (26)    |                                                           |
|                                                                                                                      | No difficulty              | 30 (28)    |                                                           |
| Have you had difficulty dressing yourself, because of your elbow problem?                                            | Impossible to do           | 4 (4)      |                                                           |
|                                                                                                                      | Extreme difficulty         | 12 (11)    |                                                           |
|                                                                                                                      | Moderate difficulty        | 23 (22)    |                                                           |
|                                                                                                                      | A little bit of difficulty | 28 (26)    |                                                           |
|                                                                                                                      | No difficulty              | 40 (37)    |                                                           |
| Have you felt that your elbow problem is 'controlling your life'?                                                    | Every day                  | 22 (21)    |                                                           |
|                                                                                                                      | Most days                  | 23 (21)    |                                                           |
|                                                                                                                      | Some days                  | 24 (22)    |                                                           |
|                                                                                                                      | Occasionally               | 22 (21)    |                                                           |
|                                                                                                                      | Not at all                 | 16 (15)    |                                                           |
| How much has your elbow problem been 'on your mind'?                                                                 | All of the time            | 27 (25)    |                                                           |
|                                                                                                                      | Most of the time           | 39 (37)    |                                                           |
|                                                                                                                      | Some of the time           | 25 (23)    |                                                           |
|                                                                                                                      | A little of the time       | 13 (12)    |                                                           |
|                                                                                                                      | Not at all                 | 3 (3)      |                                                           |
| Have you been troubled by pain from your elbow in bed at night?                                                      | Every night                | 28 (26)    |                                                           |
|                                                                                                                      | Most nights                | 26 (24)    |                                                           |
|                                                                                                                      | Some nights                | 28 (26)    |                                                           |
|                                                                                                                      | 1 or 2 nights              | 11 (11)    |                                                           |
|                                                                                                                      | Not at all                 | 14 (13)    |                                                           |
| How often has your elbow pain interfered with your sleeping?                                                         | All of the time            | 15 (14)    |                                                           |
|                                                                                                                      | Most of the time           | 24 (23)    |                                                           |
|                                                                                                                      | Some of the time           | 25 (23)    |                                                           |
|                                                                                                                      | A little of the time       | 25 (23)    |                                                           |
|                                                                                                                      | Not at all                 | 18 (17)    |                                                           |
| How much has your elbow problem interfered with your usual work or everyday activities?                              | Totally                    | 15 (14)    |                                                           |
|                                                                                                                      | Greatly                    | 27 (25)    |                                                           |
|                                                                                                                      | Moderately                 | 38 (36)    |                                                           |
|                                                                                                                      | A little bit               | 18 (17)    |                                                           |
|                                                                                                                      | Not at all                 | 9 (8)      |                                                           |
| Has your elbow problem limited your ability to take part in leisure activities that you enjoy doing?                 | All of the time            | 21 (19)    |                                                           |
|                                                                                                                      | Most of the time           | 18 (17)    |                                                           |
|                                                                                                                      | Some of the time           | 30 (28)    |                                                           |
|                                                                                                                      | A little of the time       | 18 (17)    |                                                           |
|                                                                                                                      | Not at all                 | 20 (19)    |                                                           |
| How would you describe the worst pain you have from your elbow?                                                      | Unbearable                 | 17 (16)    |                                                           |
|                                                                                                                      | Severe pain                | 54 (50)    |                                                           |
|                                                                                                                      | Moderate pain              | 19 (18)    |                                                           |
|                                                                                                                      | Mild pain                  | 11 (10)    |                                                           |
|                                                                                                                      | No pain                    | 6 (6)      |                                                           |

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| Item options                                                                                 | Response                   | Number (%) | Items excluded (X) from final version of OES, plus reason                                                                 |
|----------------------------------------------------------------------------------------------|----------------------------|------------|---------------------------------------------------------------------------------------------------------------------------|
| How would you describe the pain you usually have from your elbow?                            | Unbearable                 | 2 (2)      |                                                                                                                           |
|                                                                                              | Severe pain                | 23 (22)    |                                                                                                                           |
|                                                                                              | Moderate pain              | 49 (46)    |                                                                                                                           |
|                                                                                              | Mild pain                  | 26 (24)    |                                                                                                                           |
|                                                                                              | No pain                    | 7 (6)      |                                                                                                                           |
| Have you had trouble with transport, because of your elbow problem?                          | All of the time            | 9 (8)      | X                                                                                                                         |
|                                                                                              | Most of the time           | 11 (10)    | Item excluded due to extreme 'ceiling effect'                                                                             |
|                                                                                              | Some of the time           | 8 (8)      |                                                                                                                           |
|                                                                                              | A little of the time       | 19 (18)    |                                                                                                                           |
|                                                                                              | Not at all                 | 60 (56)    |                                                                                                                           |
| Have you had difficulty using the lavatory, because of your elbow problem?                   | All of the time            | 3 (3)      | X                                                                                                                         |
|                                                                                              | Most of the time           | 8 (8)      | Item excluded due to extreme 'ceiling effect'                                                                             |
|                                                                                              | Some of the time           | 13 (12)    |                                                                                                                           |
|                                                                                              | A little of the time       | 13 (12)    |                                                                                                                           |
|                                                                                              | Not at all                 | 70 (65)    |                                                                                                                           |
| How much of the time have you been in low spirits because of your elbow problem?             | All of the time            | 3 (3)      | X                                                                                                                         |
|                                                                                              | Most of the time           | 23 (22)    | Item excluded due to disordered response categories in Rasch analysis                                                     |
|                                                                                              | Some of the time           | 11 (10)    |                                                                                                                           |
|                                                                                              | A little of the time       | 43 (40)    |                                                                                                                           |
|                                                                                              | Not at all                 | 27 (25)    |                                                                                                                           |
| Have you had difficulty turning a key in a lock, because of your elbow problem?              | Impossible to do           | 11 (10)    | X                                                                                                                         |
|                                                                                              | Extreme difficulty         | 12 (11)    | Item excluded due to cross-loading in factor analysis and patients' ability to use other arm/hand instead                 |
|                                                                                              | Moderate difficulty        | 24 (23)    |                                                                                                                           |
|                                                                                              | A little bit of difficulty | 14 (13)    |                                                                                                                           |
|                                                                                              | No difficulty              | 46 (43)    |                                                                                                                           |
| Have you had difficulty holding a telephone or a mobile phone because of your elbow problem? | Impossible to do           | 6 (6)      | X                                                                                                                         |
|                                                                                              | Extreme difficulty         | 17 (16)    | Item excluded due to disordered response categories in Rasch analysis and patients' ability to use other arm/hand instead |
|                                                                                              | Moderate difficulty        | 30 (28)    |                                                                                                                           |
|                                                                                              | A little bit of difficulty | 20 (19)    |                                                                                                                           |
|                                                                                              | No difficulty              | 34 (31)    |                                                                                                                           |

**Table b.** Rasch analysis

Dimensionality application of a unidimensional Rasch model to the final 12-item questionnaire confirmed that the Oxford elbow score, used as one composite scale is not unidimensional ( $\chi^2 = 46.2$ ,  $df = 24$ ,  $p = 0.004$ ). Rasch models were next fitted to each of the three subscales, or domains, identified by the factor analysis. The four items of the elbow function domain scale were clearly unidimensional ( $\chi^2 = 6.32$ ,  $df = 8$ ,  $p = 0.61$ ), with no item significantly misfitting at the 5% level (highest residual = 1.4). In addition, the item thresholds were all properly ordered. The four-item pain domain was also unidimensional ( $\chi^2 = 12.67$ ,  $df = 8$ ,  $p = 0.12$ ), with no item significantly misfitting at the 5% level (highest residual 1.7) and all items having ordered thresholds. The four-item social-psychological domain was also found to be unidimensional ( $\chi^2 = 10.7$ ,  $df = 8$ ,  $p = 0.22$ ), with all item thresholds being properly ordered. However, one item, 'limited leisure activities', was found significantly to misfit at the 5% level (residual = 2.2,  $p = 0.03$ ). This item had two pairs of response options ('occasionally' and 'some of the time'; 'most of the time' and 'all of the time'), that did not discriminate well from each other, although all item thresholds were ordered. The item was recorded for the Rasch analysis into three categories (not at all, occasionally/some, most/all), with there being no significant misfit following recoding (residual = 2.5,  $p = 0.69$ ) and the domain remaining unidimensional ( $\chi^2 = 1.58$ ,  $df = 8$ ,  $p = 0.99$ ). The item was retained as it is a conceptually useful item. It may be that leisure activities are either impaired or not, and thus this particular difficulty cannot be differentiated. Further research could explore this hypothesis.