

## **SCORING MANUAL FOR THE EPILEPSY SURGERY INVENTORY (ESI)-55**

### **CONTENT OF THE ESI-55**

The Epilepsy Surgery Inventory (ESI)-55 taps eleven health concepts: health perceptions, energy/fatigue, overall quality of life, social functioning, emotional well-being, cognitive functioning, role limitations due to emotional problems, role limitations due to memory problems, role limitations due to physical health problems, physical functioning, and pain (Vickrey, Hays, Graber, et al., 1992). It also includes a single item that provides an indication of perceived change in health. The ESI-55 contains the RAND 36-Item Health Survey 1.0 (a.k.a. SF-36) as the basis for its generic core (RAND, 1992; Ware and Sherbourne, 1992). Items in this 36-item measure were adapted from longer instruments completed by patients participating in the Medical Outcomes Study (MOS), an observational study of variations in physician practice styles and patient outcomes in different systems of health care delivery (Stewart, Sherbourne, Hays, et al., 1992). The ESI-55 also contains a 19-item supplement: 5 other items exactly as written from the Medical Outcomes Study, 8 items adapted from other items in the Medical Outcomes Study, 1 Dartmouth COOP Chart (Nelson, Landgraf, Hays et al., 1990), 1 item from a study on patient preferences (Hadorn and Hays, 1991), and 4 items developed *de novo*.

### **SCORING RULES FOR THE ESI-55**

Scoring the ESI-55 is a two-step process. First, precoded numeric values are recoded per the scoring key given in Table 1. Note that after recoding, all

items are scored so that a higher number reflects a more favorable health state. In addition, each item is scored on a 0 to 100 range so that the lowest and highest possible scores are set at 0 and 100, respectively. Scores represent the percentage of total possible score achieved. In step 2, items in the same scale are averaged together to create the 11 scale scores. Table 2 lists the items averaged together to create each scale. Items that are left blank (missing data) are not taken into account when calculating the scale scores. Hence, scale scores represent the average for all items in the scale that the respondent answered.

*Example:* Items 24 and 34 are used to score the measure of social functioning. Item 24 has 5 response choices, and item 34 has 6 response choices. A high score (response choice 5) on item 24 indicates extreme limitations in social functioning, while a high score (response choice 6) on item 34 indicates the absence of limitations in social functioning. To score both items in the same direction, Table 1 shows that responses 1 through 5 for item 24 should be recoded to values of 100, 75, 50, 25, and 0, respectively. Responses 1 through 6 for item 34 should be recoded to values of 0, 20, 40, 60, 80, and 100, respectively. Table 2 shows that these two recoded items should be averaged together to form the social functioning scale. If the respondent is missing one of the two items, the person's score will be equal to that of the recoded value of the nonmissing item.

### COMPOSITE SCORES

Three composite scores - mental health, physical health, and role functioning - can be derived by weighting and summing selected ESI-55 scale scores (Table 3). The specific scales and weights contributing to each composite

score are based on an oblique (Promax) three-factor rotated solution for the 11 ESI-55 scales (Vickrey, et al., 1992). Only ESI-55 scales having a factor loading exceeding 0.20 on a factor were selected to contribute to that factor's composite score. Weights for these selected scales were calculated by dividing each scale's factor loading by the sum of the factor loading of all scales selected as contributing to that factor's composite score. Thus, composite scores can range from 0 to 100; higher scores indicate better quality of life.

**DESCRIPTIVE STATISTICS AND INTERNAL CONSISTENCY RELIABILITY**

Table 4 presents information on the reliability, central tendency and variability of the ESI-55 scales and composite scores in a group of patients who had previously undergone surgery for epilepsy or who had been evaluated for epilepsy surgery on a protocol (Vickrey, et al., 1992).

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You are hereby granted permission to use the ESI-55 for noncommercial purposes.

For written permission to use the ESI-55, write:

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**References**

Hadorn D, Hays RD. Multitrait-multimethod analysis of health-related quality of life preferences. *Med Care* 1991;29:829-840.

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Table 1

STEP 1: RECODING ITEMS

Item Numbers	Change original response category <sup>a</sup>	To recoded value of:
1,3,24,41,43,45,48	1 ----->	100
	2 ----->	75
	3 ----->	50
	4 ----->	25
	5 ----->	0
2	0 ----->	0
	1 ----->	10
	2 ----->	20
	3 ----->	30
	4 ----->	40
	5 ----->	50
	6 ----->	60
	7 ----->	70
	8 ----->	80
	9 ----->	90
10 ----->	100	
4,5,6,7,8,9,10,11,12,13	1 ----->	0
	2 ----->	50
	3 ----->	100
14,15,16,17,18,19,20,21,22, 23,51,52,53,54,55	1 ----->	0
	2 ----->	100

<sup>a</sup>Pre-coded response choices as printed in the questionnaire

Table 1 (CONTINUED)  
STEP 1: RECODING ITEMS

Item Numbers	Change original response category <sup>a</sup>	To recoded value of:
25,28,29,32,40	1 ----->	100
	2 ----->	80
	3 ----->	60
	4 ----->	40
	5 ----->	20
	6 ----->	0
26,27,30,31,33,34,35,36, 37,38,39	1 ----->	0
	2 ----->	20
	3 ----->	40
	4 ----->	60
	5 ----->	80
	6 ----->	100
42,44,46,47	1 ----->	0
	2 ----->	25
	3 ----->	50
	4 ----->	75
	5 ----->	100
49,50	1 ----->	0
	2 ----->	33.3
	3 ----->	66.7
	4 ----->	100

<sup>a</sup>Pre-coded response choices as printed in the questionnaire

Table 2

STEP 2: AVERAGING ITEMS TO FORM SCALES

Scale	Number of Items	After Recoding Per Table 1, Average The Following Items
Health perceptions	9	1 37 39 42 43 44 45 46 47
Energy/fatigue	4	25 29 31 33
Overall quality of life	2	2 48
Social functioning	2	24 34
Emotional well-being	5	26 27 28 30 32
Cognitive functioning	5	35 36 38 49 50
Role limitations due to emotional problems	5	19 20 21 22 23
Role limitations due to memory problems	5	51 52 53 54 55
Role limitations due to physical problems	5	14 15 16 17 18
Physical functioning	10	4 5 6 7 8 9 10 11 12 13
Pain	2	40 41

Table 3

FORMULAE FOR CALCULATING COMPOSITE SCORES

Composite	Formula (using ESI-55 scale scores, 0-100 point scores)
Mental Health	= .24 * Emotional well-being + .24 * Overall quality of life + .16 * Energy/fatigue + .15 * Health perceptions + .12 * Social function + .09 * Cognitive function
Physical Health	= .27 * Physical function + .22 * Role limitations-physical + .20 * Pain + .20 * Health perceptions + .11 * Energy/fatigue
Role Functioning	= .27 * Role limitations-memory + .25 * Role limitations-emotional + .17 * Cognitive function + .16 * Role limitations-physical + .15 * Social function

Table 4

RELIABILITY, CENTRAL TENDENCY, AND VARIABILITY OF ESI-55 SCALES<sup>a</sup>

Scale	Number of Items	Alpha Reliability	Mean (0-100 range)	Standard Deviation
Health perceptions	9	.85	77.1	18.0
Energy/fatigue	4	.85	63.2	19.3
Overall quality of life	2	.76	74.3	17.4
Social functioning	2	.68	81.3	22.9
Emotional well-being	5	.82	72.5	17.6
Cognitive functioning	5	.83	73.6	21.4
Role limitations due to emotional problems	5	.86	78.6	32.7
Role limitations due to memory problems	5	.81	79.5	30.7
Role limitations due to physical problems	5	.85	77.4	32.7
Physical functioning	10	.88	90.5	16.3
Pain	2	.80	83.4	20.4
Mental Health	27	-	72.9	14.8
Physical Health	30	-	80.6	16.3
Role Functioning	22	-	78.1	22.3

<sup>a</sup>N ranged from 196 to 200 patients who had previously undergone surgery for epilepsy or had been evaluated for surgery on a protocol.