FULL-LENGTH ORIGINAL RESEARCH

Health-related quality of life, mood, and patient satisfaction after epilepsy surgery in Sweden—A prospective controlled observational study

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Summary

Objective: To evaluate health-related quality of life (HRQOL), mood, and patient satisfaction in epilepsy surgery candidates before and 2 years after epilepsy surgery or presurgical investigation.

Methods: In this prospective study of 141 patients, 96 underwent surgery and 45 did not. Questionnaires at baseline and at 2-year follow-up included the generic 36-item Short Form Health Survey (SF-36), the Hospital Anxiety and Depression scale (HAD), and operated patients answered patient satisfaction questions. SF-36 scores were compared with scores from a matched sample from the Swedish norm population. Numbers were calculated of patients achieving a minimum important change (MIC) in the SF-36 Physical Composite Summary (PCS) and Mental Composite Summary (MCS).

Results: At baseline, patients had significantly lower values than the norm on all SF-36 domains. At follow-up, operated patients were divided into seizure-free (International League Against Epilepsy [ILAE] class 1 and 2, n = 53) or with continued seizures (n = 43). No differences in baseline HAD or SF-36 values were found between these groups. Seizure-free patients reached the same levels as the norm in all SF-36 domains except Social Function. Operated patients with continued seizures and nonoperated patients had unchanged scores. Fifty-one percent of seizure-free patients had an improvement reaching MIC for PCS and 45% for MCS. Corresponding results for patients with continued seizures were 28% in PCS and 28% in MCS, for nonoperated 33% in PCS and 29% in MCS. HAD anxiety scores improved significantly in only the seizure-free patients. Of all operated patients, 80% were satisfied with having had surgery and 86% considered that they had benefited, whereas 20% thought that surgery caused some harm.

Significance: In patients who were seizure-free after epilepsy surgery HRQOL normalized and anxiety decreased. Operated patients overwhelmingly considered epilepsy surgery to be beneficial. Nonetheless, only about half of the seizure-free patients achieved important HRQOL improvements, suggesting that seizure freedom does not in and of itself guarantee improved patient well-being.

KEY WORDS: Quality of life, Patient satisfaction, Mood, Epilepsy surgery.

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Epilepsy surgery is a valuable treatment in patients with drug-resistant focal epilepsy. A majority of patients obtain seizure freedom.[1,2] However, patients also hope for improvement in many domains of life, for example, physical, psychological, and social functioning.[3] It is therefore necessary to evaluate outcomes comprehensively. Assessments of health-related quality of life (HRQOL) have demonstrated improvement after epilepsy surgery, especially in patients who are seizure-free or who obtain ≥75% reduction in seizure frequency.[1,4–10] These positive changes may require up to 2 years postsurgery to consolidate.[5,11,12] Most studies are single center, and a limited number have a longitudinal controlled design.[8] Patient satisfaction with epilepsy surgery is less often evaluated than HRQOL and mood.[13]

Most studies evaluating the effects of epilepsy surgery on HRQOL have relied on statistical significance testing of group mean outcomes: providing information about the relative efficacy with respect to the "average" patient. However, some patients may achieve considerable improvement, others less, and still others may even experience various levels of deterioration. Other methods for interpreting the significance of change, such as numbers needed to treat, may be of more clinical value. A problem in applying such methods may be that it is often difficult to define what a responder is. HRQOL scores and particularly HRQOL change scores have little intuitive meaning, but their significance is derived by anchoring them to other relevant indicators, such as return to work or medication change, in order to understand the implications of achieved levels of change. Nonetheless, from a clinical perspective the most relevant indicator against which to judge the significance of change is the patient him/herself. During the past decades much research has aimed at establishing cutoffs representing the minimum amount of change in various HRQOL scores that patients would consider important or beneficial,[14] often referred to as minimum important change (MIC). MICs for the widely used generic HRQL instrument 36-item Short Form Health Survey (SF-36) are available for interpreting clinical outcomes generally.[15] As MICs are known to vary depending on disease,[14] epilepsy-specific MICs for the SF-36 have also been developed by relating patient assessments of change in five areas (overall HRQOL, general health, social activities and work, seizures, and drug side effects) with change in SF-36 Physical and Mental Component Summary scores.[16] To our knowledge, no studies have applied these epilepsy-specific MIC estimates to gauge the HRQOL benefits of epilepsy surgery.

The aim of the present prospective, national and population-based study was to compare operated patients (categorized as seizure-free or with continued seizures) and nonoperated patients before and 2 years after surgery or presurgical investigation, respectively, regarding seizure outcome, HRQOL, depression, anxiety, and patient satisfaction. A secondary aim was to determine the number of patients in each group who achieved HRQOL improvements corresponding to published MIC estimates.[16]

Methods and Patients

All epilepsy surgery procedures in Sweden are prospectively reported to the population-based Swedish National Epilepsy Surgery Register (SNESUR). Information is collected longitudinally for each patient and contains baseline information about epilepsy history, preoperative seizure types and syndromes, mean monthly seizure frequency during the year preceding the presurgical investigation, antiepileptic drugs (AEDs), preoperative investigations, psychosocial data, surgical data, histopathologic diagnoses, and postoperative complications. Two-year follow-up data cover seizure types and frequencies, AEDs, and psychosocial data. For this study we had access to baseline and follow-up data from the register for all operated patients but not for the nonoperated patients.

This investigation is a prospective longitudinal survey study of adult epilepsy surgery candidates who underwent presurgical evaluation in Sweden from 1995 to 1998. Patients were asked to complete a questionnaire at the time of presurgical evaluation (baseline) and a follow-up questionnaire 2 years postoperatively for those operated versus 2 years after presurgical evaluation. Patients ≥16 years were included, since SF-36 is validated from that age. Patients with IQ <70 were excluded, since it was doubtful that they could answer the survey questions adequately. The questionnaires were distributed by the epilepsy nurses at the centers and were self-administered. Patients did not receive payment for participating. The study was approved by the University of Gothenburg Regional Board of Medical Ethics, and informed consent for research was obtained from all patients.

Outcome measures

Seizure outcome

For the purpose of this study, seizure freedom was defined as no seizures, with or without auras (ILAE class I and 2[17]) in the last year of follow-up. Patients with continued seizures were not categorized further due to their limited number.

Patient-reported outcomes

SF-36. The Swedish version of the Medical Outcome Study 36-item Short Form Health Survey (SF-36) was used to measure HRQOL.[18] The SF-36 is a widely used generic questionnaire that measures eight HRQOL domains: Physical Functioning (PF), Role Limitation-Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Limitation-Emotional (RE), and Mental Health (MH). Domain scores range from 0 to 100;

higher scores represent better health status. Scores from the eight domains may be aggregated into two summary measures: physical component summary (PCS) and mental component summary (MCS). MCS and PCS are transformed to *t*-scores with a mean of 50 and standard deviation (SD) of 10. The Swedish version of SF-36 has shown good reliability and validity.[19,20]

A sex- and age-matched reference sample (n = 987) was drawn from the Swedish SF-36 normative database, which contains data from 8,930 persons.[18]

Published MIC estimates for SF-36 PCS (MIC = 3.0) and MCS (MIC = 4.6) for use in epilepsy populations were applied to assess the importance of change scores between baseline and follow-up.[16] The clinical characteristics of our patient population were comparable to the study sample used for determining these MICs.

Hospital Anxiety and Depression scale. The Hospital Anxiety and Depression (HAD) scale consists of 14 items measuring anxiety (HAD-A) and depression (HAD-D) in two separate subscales.[21] Items are rated on a four-point Likert scale (0–3) and ratings are summed to give a score range from 0 (no symptoms) to 21 (maximum distress) for both depression and anxiety. Cutoffs for possible clinical cases (8–10 points) and probable clinical cases (>10 points) have been established.[21]

Patient satisfaction and other questions. For the operated patients the survey at the 2-year follow-up included the following questions: *How satisfied are you with the epilepsy surgery procedure?* (seven-step Likert scale: very satisfied – very dissatisfied); *Overall, do you consider the epilepsy operation to have been useful to you?* (yes/no); *Do you in any way consider the epilepsy operation to have been harmful to you?* (yes/no). Nonoperated patients were asked questions covering sociodemographic (education, living situation, marital status, work, and sick leave) and clinical variables (seizure frequency and AED treatment) both at baseline and at follow-up. Both groups were asked to indicate how much they worked at follow-up compared to baseline.

Statistical methods

For descriptive purposes, means, medians, 95% confidence intervals, and interquartile ranges were used. Nonparametric statistical methods were used due to the nonnormal distribution and ordinal-level of the HAD and SF-36 data. Baseline differences between operated (Op) and nonoperated (Nonop) patients in sociodemographic variables and seizure frequency at baseline were tested with the Mann-Whitney *U* test for continuous variables or the chi-square test for categorical variables. When analyzing HRQOL outcomes, patients were divided into the following groups: operated patients who were seizure-free at 2-year follow-up (Opszfr); operated patients who had persistent seizures after surgery (Opszpr); and nonoperated (Nonop). SF-36 and HAD change scores were computed as the difference between baseline and follow-up scores. The Wilcoxon signed-rank test was used to test for within-group differences between baseline and at 2-year follow-up on the SF-36 and HAD values. Comparisons between SF-36 baseline and follow-up values with population reference values were conducted using the Mann-Whitney *U* test. Between-group differences at baseline, follow-up, and in baseline-follow-up change scores were first tested using Kruskal-Wallis test and followed by pairwise comparisons using the Mann-Whitney *U* test. All tests were two-tailed and a 5% significance level was used throughout. All analyses were conducted using PASW SPSS version 18 (Chicago, IL, U.S.A.).

Standardized response means (SRMs) were calculated to estimate the magnitude of the differences in SF-36 values between baseline and follow-up. SRMs were calculated as the difference between mean values divided by the standard deviation of change scores. SRM magnitudes were interpreted against the criteria suggested by Cohen: trivial (0 to <0.2), small (≥0.2 to <0.5, moderate (≥0.5 to <0.8), and large (≥0.8).[22] Differences in the proportions of patients in the Opszfr, Opszpr, and Nonop groups who reached PCS and MCS MIC thresholds were tested with Pearson's chi-square test.

Results

Patient groups

During the study period, 198 patients >16 years underwent epilepsy surgery in Sweden. One hundred eighteen patients who were eventually operated answered the survey at baseline and 96 (81%) completed both surveys. Based on register data we compared demographic and epilepsy data for the 96 operated patients in the study group with corresponding data from the 102 patients who constitute the operated nonstudy group. There were no differences between the two groups concerning age, sex, preoperative seizure frequency, neurological deficits, resection types, postoperative seizure outcome, AED treatment before and 2 years after surgery, and sociodemographic variables, except level of education, which was higher in the study group ($p < 0.05$). There were one major and 10 (10%) minor complications in the operated study group compared to five (5%) major complications and 20 (20%) minor complications in the operated nonstudy group ($p < 0.05$).

Of the 96 operated patients in the study group 80 underwent temporal lobe resection, 12 had frontal lobe resection, one patient each had a parietal lobe resection, a multilobe resection, a hemispherectomy, and a multiple subpial transsection. The mean time from baseline to follow-up was 28.5 months (range 18–58 months).

One hundred fourteen nonoperated patients, who underwent presurgical evaluation answered the survey at baseline. Forty-five of these (39%) completed both surveys and were included in the study. Because SNESUR does not contain data on all patients who are investigated but not operated, we do not know the total number of patients evaluated and cannot estimate whether the study population is representative of all investigated patients who were not offered surgery. The mean time from baseline to follow-up in the nonoperated group was 45 months (range 23–76). Since this was considerably longer than for the operated patients, HRQOL results from the nonoperated patients with a follow-up under the mean were compared to those with longer follow-up. Due to the range in follow-up time in both operated and nonoperated patients, all HRQOL scores were correlated to length of follow-up.

Seizure frequency at baseline and follow-up

There was no significant difference in preoperative seizure frequency between the operated and nonoperated patients (Table 1). At the 2-year follow-up, 55% of the operated versus 11% of the nonoperated patients were seizure-free ($p < 0.05$).

Both Opszfr (operated seizure-free; n = 53) and Opszpr (operated seizure persistent; n = 43) improved significantly ($p < 0.001$ and $p = 0.021$, respectively) in seizure frequency compared to baseline. There were no differences in seizure frequency in the Nonop (n = 45) group.

Sociodemographic situation at baseline and follow-up

There were no significant differences at baseline between Op and Nonop with regard to sociodemographic data (age, gender, duration of epilepsy, living, marital status, education, sick leave; Table 1). At follow-up, the Op patients had significantly lower sick leave due to epilepsy ($p < 0.001$).

Table 1. Baseline patient data

	Op (n = 96)	Nonop (n = 45)	Comparison between Op and Nonop[a]
Age			
Median (years)	33	33	ns
Range (years)	15–55	20–62	
Duration of epilepsy			
Median (years)	16.5	17	ns
Range (years)	1–46	2–49	
Gender (%)			
Men	49	38	ns
Women	51	62	
Marital status (Op n = 95) (%)			
Single/divorced/widow	45	56	ns
Married/living with partner	55	44	
Living (Op n = 95) (%)			
With parents/siblings	21	20	ns
With partner/children/single	79	80	
Highest education (Op n = 94) (%)			
High school or higher	53	49	ns
Not completed high school	47	51	
On sick leave (%)	32	53	ns
Seizure frequency (%)			
At least every week	49	60	ns
Less than every week	51	40	

Op, operated; Nonop, nonoperated; ns, nonsignificant.
[a]Mann-Whitney *U* test.

Table 2. Numbers (percent) of patients with possible/probable depression and anxiety at baseline (I) versus follow-up (II)

	HAD depression n (%)	HAD anxiety n (%)
Opszfr I (n = 53)	6 (11)	17 (32)
Opszfr II (n = 53)	6 (11)	8 (15)
I–II, p-value[a]	ns	<0.000
Opszpr I (n = 42)	7 (17)	14 (33)
Opszpr II (n = 42)	7 (17)	13 (31)
I–II, p-value	ns	ns
Nonop I (n = 45)	10 (22)	19 (42)
Nonop II (n = 44)	11 (25)	19 (43)
I–II, p-value	ns	ns

Opszfr, operated patients who were seizure-free at follow-up; Opszpr, operated patients who still had seizures at follow-up; Nonop, nonoperated epilepsy surgery candidates.
[a]Chi square; only p-values < 0.05 are shown.

In the Opszfr group, 44% reported postoperatively that they worked more than before surgery, 40% that they had a more demanding job, and 4% reported that they worked less than they had preoperatively. In the Opszpr group, 10% reported that they worked more than before surgery, 5% that they had a more demanding job, and 12% that they worked less than preoperatively.

SF-36 scores at baseline

The only significant differences between the three groups (Opszfr, Opszpr, and Nonop) at baseline were in relation to Physical Functioning ($p = 0.047$) and Social Functioning ($p = 0.038$), where the Opszpr group had the highest mean scores (Table S1).

Change in SF-36 scores between baseline and follow-up

Within-group comparisons

The Opszfr group improved significantly ($p < 0.05$) from baseline on all SF-36 domains and components, (Table S1), except Role Limitation-Emotional ($p = 0.055$). Effect sizes were large for Role Limitation-Physical and General Health, moderate for PCS, and small for all others. In contrast, the Opszpr and Nonop groups did not change significantly on any SF-36 domain. Effect sizes were all within the trivial to small range (Fig. 1). In the Nonop group there was no difference in scores between those with shorter or longer follow-up.

Between-group comparisons

Change in the Opszfr group was significantly greater than in the Opszpr group regarding Physical Functioning, Role Limitation-Physical, General Health, Vitality, Social Func-

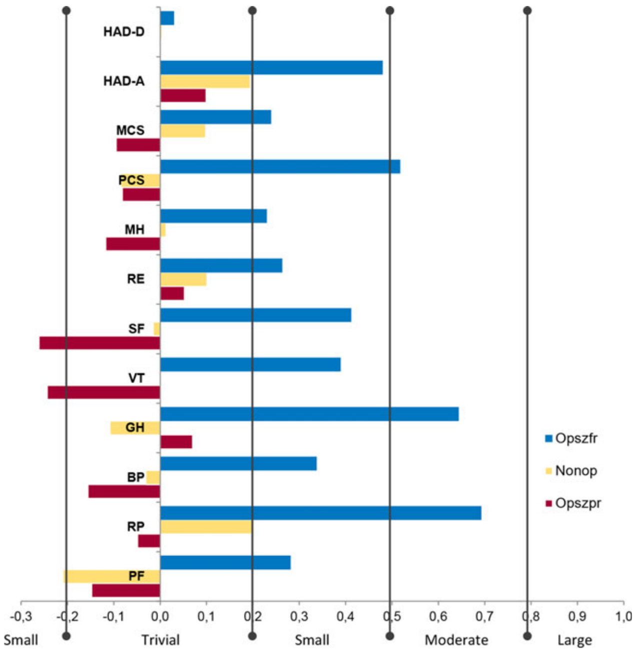

Figure 1.
Effect sizes for HAD-A, HAD-D, MCS: mental component summary of SF-36, PCS, physical component summary of SF-36, and SF-36 subscales between baseline and follow-up. Opszfr, operated patients who were seizure-free at follow-up; Opszpr, operated patients who still had seizures at follow-up; Nonop, nonoperated epilepsy surgery candidates; PF, physical function; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social function; RE, role emotional; MH, mental health
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tioning, and PCS; and than in the Nonop group regarding Physical Functioning, Role Limitation-Physical, General Health, and PCS (see Table S1). No differences in change scores were found between the Opszpr and Nonop groups.

There was no correlation between any of the SF-36 variables and length of follow-up.

Comparisons with the norm population

At baseline, the three patient groups had significantly lower ($p < 0.05$) scores than the norm population on all SF-36 domains except Bodily Pain, and in the Opszpr group also on Physical Functioning. At follow-up the Opszfr group did not differ from norm on any domain except Social Functioning. For details on all SF-36 scores see Table S1.

Minimum important change (MIC)

In the Opszfr group, 51% had improvements exceeding the MIC for PCS and 45% for MCS. Corresponding results for the Opszpr and Nonop groups were 28% versus 33% for PCS and 28% versus 29% for MCS. These proportions were significantly different between groups in relation to PCS ($\alpha^2 = 8.26$, $p = 0.016$) and close to significant for MCS ($\alpha^2 = 5.85$, $p = 0.054$). In the Opszfr group, 51% improved more than the MIC for PCS or MCS without worsening in

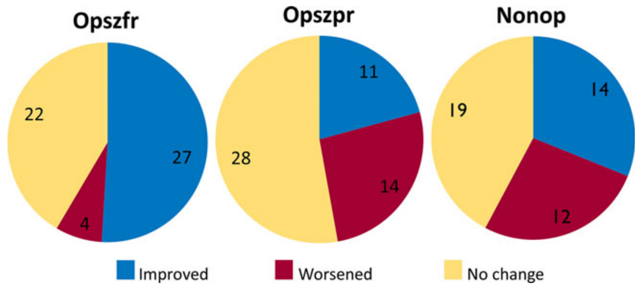

Figure 2.
Minimal important change (MIC) in SF-36 Physical (PCS; MIC = 3.0) and Mental Component Scores (MCS; MIC = 4.6). Opszfr, operated patients who were seizure-free at follow-up; Opszpr, operated patients who still had seizures at follow-up; Nonop, nonoperated epilepsy surgery candidates. Improved: Percent improved in at least one component PCS or MCS and not worsened in the other. Worsened: Percent worsened in at least one component and not improved in the other. Number of patients in each outcome category inserted in figure.
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the other component score (Fig. 2) and 25% improved on both PCS and MCS. In the Opszpr and Nonop groups the corresponding results were 26%/2% and in 31%/11%, respectively. The differences in proportions were significant in both cases ($\alpha^2 = 9.94$, $p = 0.007$; $\alpha^2 = 11.66$, $p = 0.003$).

PCS and MCS scores deteriorated more than the MIC in 12 patients (1 Opszfr, 6 Opszpr, and 5 Nonop). One of these patients had a minor complication related to surgery.

HAD scores at baseline and follow-up

Baseline differences between groups were seen in relation to HAD-D ($p < 0.05$), where the Nonop group had the lowest scores (least depression). At baseline, 11% in the Opszfr, 17% in the Opszpr, and 22% in the Nonop group had HAD scores indicating probable or possible depression. No change in HAD-D scores was seen between baseline and follow-up in any of the three groups.

No baseline differences between groups were seen in relation to HAD-A scores. At baseline, 32% in the Opszfr, 33% in the Opszpr, and 42% in the Nonop group had HAD-A scores indicating probable or possible anxiety. HAD-A scores decreased significantly between baseline and follow-up in the Opszfr group ($p < 0.001$) and effect sizes were small/moderate (SRM = 0.48), whereas there was no change in the Opszpr or in the Nonop groups and effect sizes were trivial (SRM < 0.02) (Fig. 1). In the Nonop group there was no difference in HAD-D or HAD-A scores between those with shorter or longer follow-up; nor was there any correlation between any of the HAD variables and length of follow-up.

Patient-reported satisfaction with and benefit of surgical outcome

Eighty percent of operated patients were satisfied/very satisfied with the operation, whereas 8% were dissatisfied/

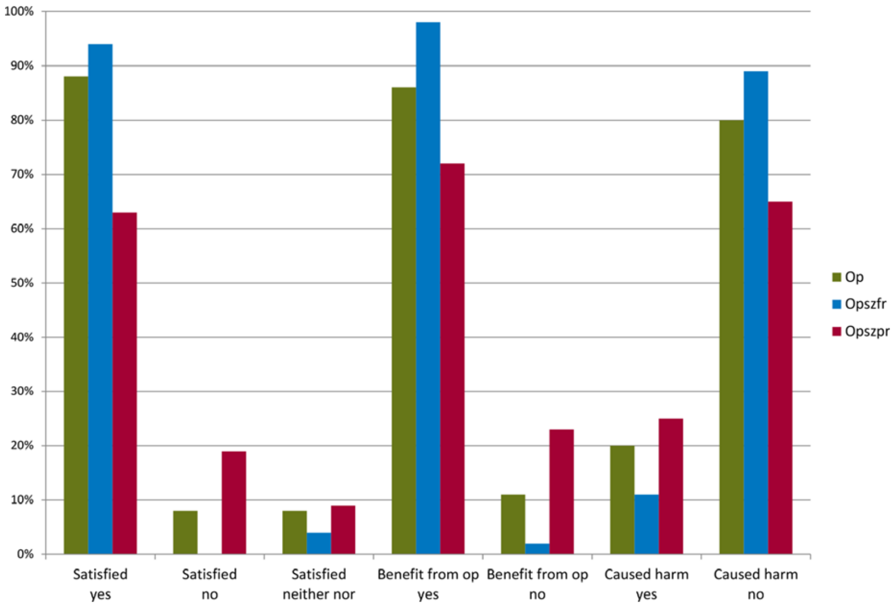

Figure 3.
Patients' self-rated outcomes of surgery. Outcomes: Satisfaction (Yes/No/Neither-nor), benefit (Yes/No), and harm (Yes/No). Opszfr, operated patients who were seizure-free at follow-up; Opszpr: operated patients who still had seizures at follow-up.
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very dissatisfied. Eighty-six percent considered that they had benefited from surgery, whereas 20% thought that the operation had caused them some harm (Fig. 3).

Discussion

This study showed that Swedish epilepsy surgery candidates scored worse on all SF-36 domains but one (Bodily Pain) compared to a large age- and sex-matched sample from the Swedish general population. Two years postoperatively, seizure-free patients had improved on nearly all SF-36 domains, with the largest effects associated with Role Functioning and General Health, and their scores were on par with those of the norm population in all domains except Social Function. Neither patients with persistent seizures after epilepsy surgery nor nonoperated patients changed significantly on any SF-36 domain between baseline and follow-up.

To our knowledge, this is the first investigation to apply an estimate of individual minimum important change (MIC) when interpreting HRQOL outcomes after epilepsy surgery.[16] On a group level of analysis, MICs help in interpreting the meaningfulness of the magnitude of an effect and thereby complement conventional statistical tests, which are limited to assessing the probability that an effect exists. They may also serve as a cutoff for identifying individual patients who achieve important HRQOL benefits from a particular intervention. More than half of the seizure-free patients had an improvement exceeding MIC for physical health status (PCS) and/or mental health status (MCS) without a decrease in the other, whereas the corresponding proportion was much smaller in the other patient groups. The finding that an important fraction of seizure-free patients did not have an improvement in HRQOL reaching MIC emphasizes that patients have desires and expectations beyond seizure freedom. Other important aspects that might not have changed as much as hoped for include freedom from AEDs, driving, independence and socializing.[3] Likewise, the patients may have changed their internal standards, values, or conceptualization of HRQOL, as discussed in the literature on response shift.[23] There is also the issue of 'the burden of normality' in patients who have problems coping with seizure freedom after having had epilepsy for more than half of their lives.[24] On the other hand a proportion of those not seizure-free also showed significant improvements in HRQOL, which might relate to improved seizure control but also to nonepilepsy-related factors.

Most of the operated patients (80%) were satisfied with surgery and considered that surgery was beneficial (86%). Although the seizure-free patients were most positive, the majority of patients with continued seizures also reported a positive outcome, which might reflect the significantly improved seizure control also in these patients.

Earlier studies using epilepsy-specific instruments have shown that physical aspects of HRQOL more consistently improve than emotional and social functioning after successful epilepsy surgery.[8] This can be seen also in the present study, confer effect sizes as illustrated in Figure 1. The reasons for this are not clear but it seems plausible that freedom from seizures has more immediate and direct implications for physical functioning, whereas improvements in social and emotional functioning are more difficult to achieve after decades of epilepsy. One other prospective longitudinal study also found that seizure-free patients normalize in all SF-36 domains except Social Function.[12] Seizure-free patients in that study scored as low as 47.9 on Social Function compared to 84.2 for the general population. In our study, seizure-free patients scored 81 (compared to 72 at baseline) which is still significantly lower than in the norm population. Possible explanations for this difference might include differences in patient samples but also societal differences. It is noteworthy that both the Opszpr and the Nonop groups scored higher in Social Function in the Swedish study than the seizure-free patients in the U.S. study (Table S1).

One vital aspect of social functioning is the ability to earn one's living. Earlier studies have found modest improvements after surgery in seizure-free patients.[25–27] We found no significant changes in employment in the present study except lower levels of sick leave due to epilepsy in the operated group. However, many of the seizure-free patients reported that they worked more and had a more demanding job, and this could have positively contributed to the improvements in HRQOL.

Patients with epilepsy have higher psychiatric morbidity than the general population, especially with regard to anxiety and depression.[28,29] Although some studies show improvement after epilepsy surgery, others show no change.[26] Several studies have shown that improvements are most marked for anxiety, which is in line with the results in our study.[11,30,31] One reason for the reduced anxiety levels at follow-up in seizure-free patients could be decreased worry about seizures.

The strengths of this study include the prospective longitudinal controlled study design and comparisons of operated patients, both with patients who were presurgically evaluated but not operated and with an age- and sex-matched sample of the norm population. The operated sample was shown to be reasonably representative of all patients >16 years operated in Sweden during the study period and 81% of the patients answered both surveys. The 2-year follow-up used in our study has been repeatedly shown to be adequate in order to measure postoperative HRQOL.[4,5,12,32] This is also the first study to apply patient centered assessments of minimum important change after epilepsy surgery and one of few studies tapping patient satisfaction.

One weakness of the study is that we have not used epilepsy-specific HRQOL scales, such as quality of life in epilepsy-89 (QOLIE-89) instrument or epilepsy surgery inventory (ESI-55), which have been shown to be more sensitive to change. QOLIE-89 and quality of life in epilepsy-31 (QOLIE-31) have also been shown to distinguish accurately between minimum important change and medium or large change.[16] SF-36 was not shown to be sensitive for detecting such changes, and hence we were unable to report more precise estimates of change. Although we found clear-cut changes in HRQOL, the use of epilepsy-specific scales might have provided additional information. It is also important to note that Wiebe et al.[16] point out that their MICs may be less accurate for judging worsening than improvement, and our results in this regard should therefore be interpreted with caution. Another weakness concerns the representativeness of the nonoperated group. Because only 39% of the nonoperated patients included in the study answered both surveys, the study sample may not be representative of all investigated but nonoperated patients. It may be speculated that the sample was biased in favor of those who had experienced some improvements or had been offered other treatments (e.g., 29% in the Nonop group had vagus nerve stimulation at follow-up).

In conclusion, although the present study confirmed HRQOL outcomes from other prospective studies in the Swedish epilepsy surgery population, we have for the first time demonstrated that on an individual basis about half of the seizure-free patients had an improvement reaching minimum important change. HRQOL normalized in seizure-free patients and there was no change in patients with persistent seizures or nonoperated at group level, although a small proportion in both groups improved. Still, most patients were satisfied with having had epilepsy surgery.

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Disclosure or Conflicts of Interest

Dr. Malmgren has served on an educational advisory board for UCB and has received speaker's honoraria from UCB. The remaining authors have no conflicts of interest. We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1. Comparisons of SF-36 and HAD change scores between baseline and follow-up.