

MULTI-DIMENSIONAL PREDICTORS OF LONG-TERM SCS SUCCESS: MOVING BEYOND THE NUMERICAL PAIN SCORE

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Introduction

Spinal cord stimulation (SCS) trial success is commonly defined by a $\geq 50\%$ reduction in pain scores; however, there is a paucity of literature validating this threshold as the minimal clinically important difference. The Patient's Global Impression of Change (PGIC) provides a more holistic assessment of a patient's status and may better identify responders to SCS therapy. In this study, we examined how well it correlates with NRS and other measures of pain or its impact on the patient's function and wellbeing.

Materials and Methods

Following Institutional Research Ethics Board approval (#18-5864), we conducted a retrospective analysis of patients receiving a permanent SCS implant between August 2017 and September 2024. Data, including scores from the Numerical Rating Scale (NRS), Neuropathic Pain Symptom Inventory (NPSI), Pain Catastrophizing Scale (PCS), Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), Brief Pain Inventory (BPI), Pittsburgh Sleep Quality Inventory (PSQI), and EQ-5D VAS, were collected at baseline and 12 months post-implantation, along with a 12-month PGIC rating. Responders were defined using three thresholds: $\geq 50\%$ NRS reduction (NRS50), $\geq 30\%$ NRS reduction (NRS30), and a PGIC score of ≥ 6 ("Much" or "Very much improved"). We then compared baseline clinical scores and the magnitude of change at 12 months between responders and non-responders for each threshold to assess the relative contribution of each measure to a successful outcome.

PGIC score	PGIC category
1	Very much worse
2	Much worse
3	Minimally worse
4	No change
5	Minimally improved
6	Much improved
7	Very much improved

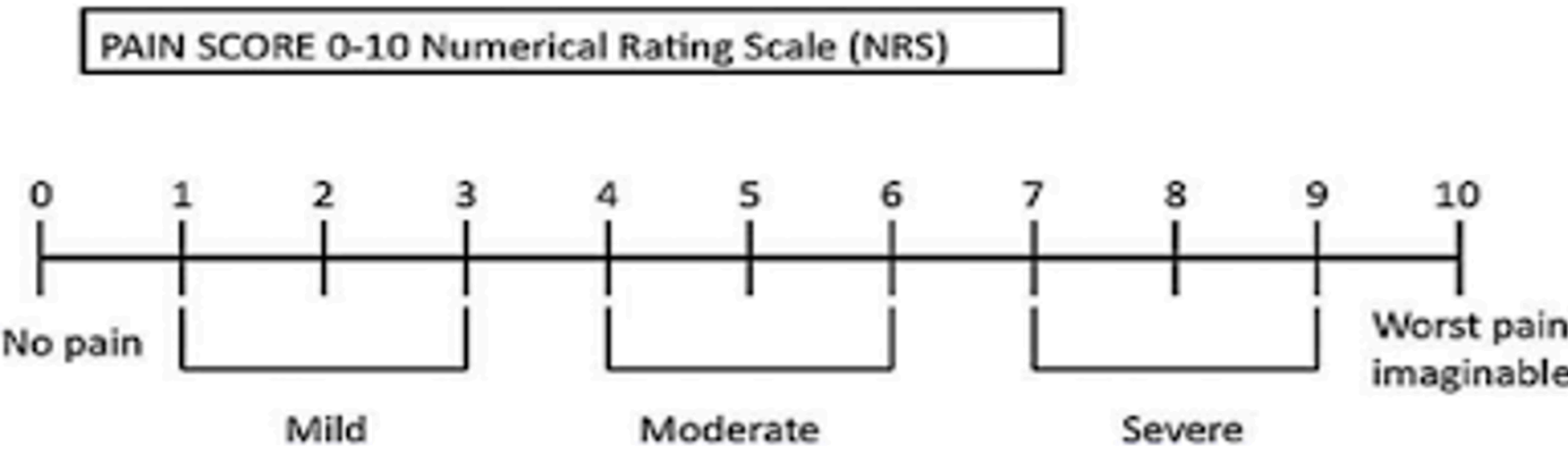


Figure 1. Percentage Change in Clinical Scores at 12 Months for SCS Responders

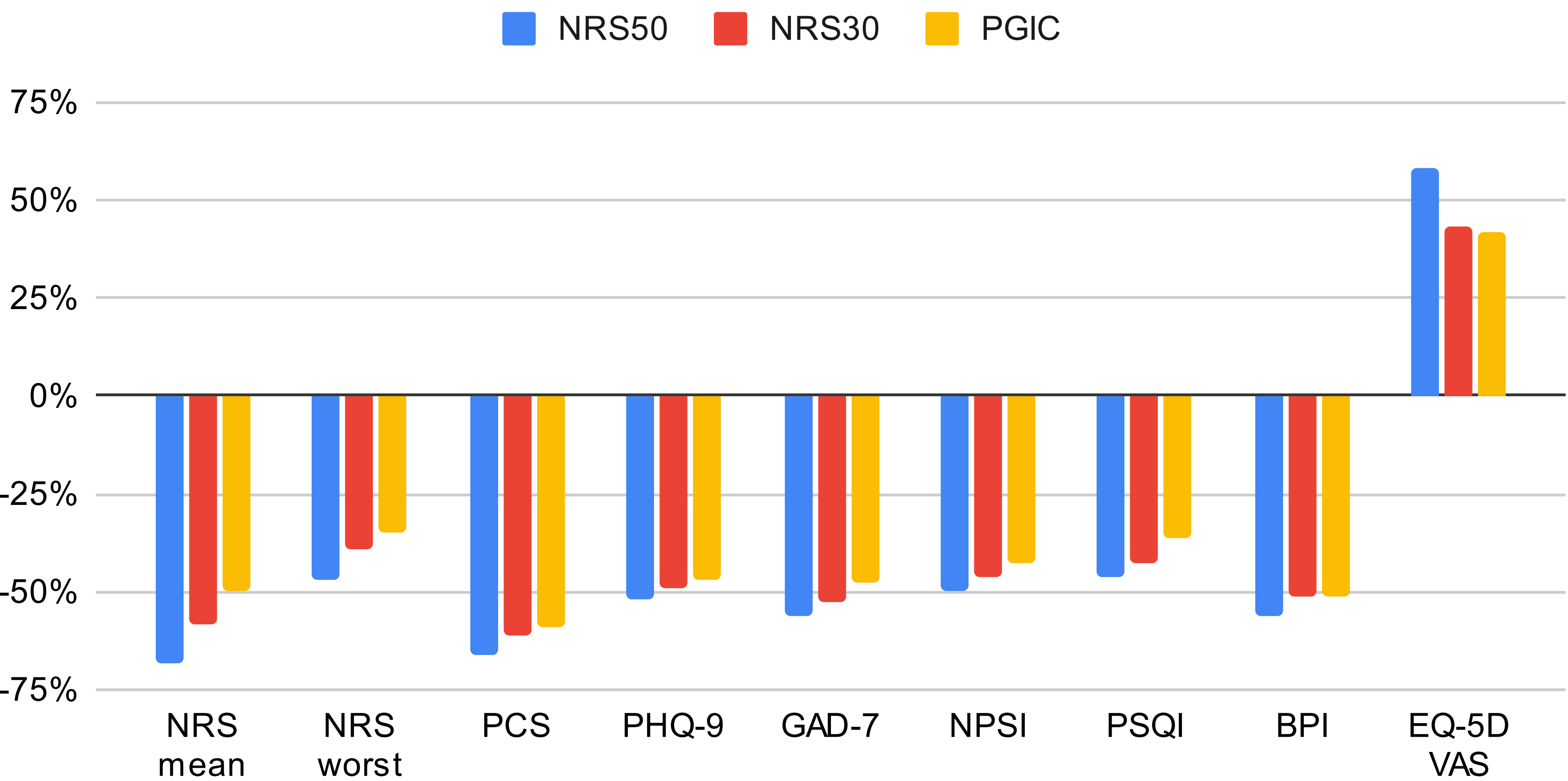


Table 1. Baseline demographics of 248 patients who received SCS implants for pain. Data are mean ($\pm$ Standard Deviations) or numbers (percentages).

Variable	Value
Age (Years)	53.1 $\pm$ 14.1
Female	131 (53%)
Diagnoses:	
PSPS	129 (52.0 %)
CRPS	27 (10.9 %)
PNP	87 (35.1 %)
Other	5 (2.0%)
Pain Duration (years)	9.0 $\pm$ 9.7
NRS Score (0-10)	6.9 $\pm$ 1.4
OMEQ (mg)	41.9 $\pm$ 73.3
DN4 score $\leq 4/10$ / $\geq 4/10$	34 (14%) / 209 (84%)
GAD-7 (0-21)	9.2 $\pm$ 6.1
PHQ-9 (0-27)	12.4 $\pm$ 6.8
PCS (0-52)	27.0 $\pm$ 6.1
NPSI (0-100)	51.2 $\pm$ 21.9
PSQI (0-23)	11.6 $\pm$ 4.9
BPI (0-70)	46.5 $\pm$ 12.7
EQ-5D VAS (0-100)	48.2 $\pm$ 23.2

BPI: Brief Pain Inventory; CRPS: Complex Regional Pain Syndrome; DN4: Douleur Neuropathique 4; EQ-5D VAS: EuroQol – 5 dimensions Visual Analogue Scale; GAD-7: Generalized Anxiety Disorder – 7 items; NPSI: Neuropathic Pain Symptom Inventory; OMEQ: oral morphine equivalents; PCS: Pain Catastrophizing Scale; PHQ-9: Patient Health Questionnaire – 9 items; PNP: Peripheral Neuropathic Pain; PSPS: Persistent Spinal Pain Syndrome; PSQI: Pittsburgh Sleep Quality Index

Results

A total of 248 patients received SCS implants during the study period (Table1). Baseline clinical scores were similar between the groups later defined as Responders or Non-responders. The number of patients meeting responder criteria varied by definition: NRS50 (n=88), PGIC (n=120), and NRS30 (n=132).

At 12 months, patients in all three responder groups demonstrated significant improvements across all measured outcomes, including NRS mean, NRS worst, PCS, PHQ, GAD7, NPSI, PSQI, BPI, and EQ-5D VAS ($p < 0.01$ for all). The percentage changes in clinical scores for the three responder criteria groups are shown in Figure 1 (Responders) and Figure 2 (Non-responders).

Discussion

The traditional $\geq 50\%$ NRS reduction criterion for defining SCS success identified the smallest cohort of responders in our study. Our findings demonstrate a similarity between a patient's global impression of change (PGIC) and a $\geq 30\%$ NRS reduction. Interestingly, patients who felt "much improved" or "Very much improved" (PGIC ≥ 6) achieved this status with a smaller average reduction in most clinical scores than even the NRS30 group. This suggests the conventional 50% cutoff may be too high, potentially excluding patients, while a 30% reduction may better reflect significant, patient-reported improvement.

Reference

Hurst H, Bolton J. Assessing the clinical significance of change scores recorded on subjective outcome measures. J Manip Physiol Ther 2004;27:26–35.

