



Spinal Cord Stimulation: Explantation and Impact on Healthcare Cost in a Retrospective Analysis

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Introduction

- Spinal Cord Stimulation (SCS) is an effective therapeutic modality providing significant benefit for many patients with chronic pain syndromes.
- Unfortunately, patients with SCS implants may require device explantation for various reasons, including infection, device related complications, need for imaging (MRI) or loss of efficacy over time.
- The purpose of this study was to attempt to evaluate the leading causes of explantation following SCS implantation surgery.

Methods

- We designed a retrospective cohort analysis using the Thompson Reuter's MarketScan database.
- Patients selected were 18 and older who had a permanent spinal cord stimulator implant between 2000 and 2009. Patients with explanted SCS systems were evaluated.
- Possible causes of explantation such as infection, device-related complication, lumbar pathology, pain, or need for MRI were analyzed.
- The impact of explantation on healthcare resource utilization was also evaluated.

Results

A total of 2456 patients underwent SCS explantation. Overall, the mean±SD age of patients with SCS explants was 52.7±13.02 years. The most common causes of explantation were infection (20.24%) and device related complication (18.43%). The annual healthcare cost was significantly higher in the explanted cohort (\$47,613.6) compared to the non-explant cohort (\$24,023.9).

Table 1. Cohort Characteristics

	Total	Received Explant/Revision
Total - no. (col%, row%)	12,327 (100.0, 100.0)	2,456 (100.0, 19.92)
Gender - no. (col%, row%)		
Male	4,780 (38.78, 100.0)	829 (33.75, 17.34)
Female	7,547 (61.22, 100.0)	1,627 (66.25, 21.56)
Age		
mean (SD)	54.1 (13.19)	52.7 (13.02)
median (IQR)	53.0 (45.0 - 62.0)	52.0 (44.0 - 61.0)
n (Min - Max)	12,327.0 (12.0 - 93.0)	2,456.0 (18.0 - 90.0)
Insurance - no. (col%, row%)		
Commercial	8,372 (67.92, 100.0)	1,583 (64.45, 18.91)
Medicaid	1,617 (13.12, 100.0)	435 (17.71, 26.90)
Medicare	2,338 (18.97, 100.0)	438 (17.83, 18.73)
PHdays		
mean (SD)	1,304.6 (809.65)	1,197.4 (731.82)
median (IQR)	1,076.0 (642.0 - 1,806.0)	1,010.0 (604.0 - 1,653.0)
n (Min - Max)	12,327.0 (-50.0 - 3,653.0)	2,456.0 (10.0 - 3,608.0)
FU days		
mean (SD)	647.0 (618.30)	1,020.0 (707.61)
median (IQR)	450.0 (179.0 - 929.0)	864.0 (450.5 - 1,453.0)
n (Min - Max)	12,327.0 (0.0 - 3,553.0)	2,456.0 (0.0 - 3,553.0)
Charlson Score - no. (col%, row%)		
0	6,630 (53.78, 100.0)	1,355 (55.17, 20.44)
1	2,987 (24.23, 100.0)	607 (24.71, 20.32)
2	1,537 (12.47, 100.0)	286 (11.64, 18.61)
3 or higher	1,173 (9.52, 100.0)	208 (8.47, 17.73)

Patients having a permanent SCS were included if they also had 1 year of prior history free of explant codes.

Table 2. Most common causes of explant

	Total	Male	Female
All explant cases - no. (col%, row%)	8,097 (100.0, 100.0)	2,786 (100.0, 34.41)	5,311 (100.0, 65.59)
Infection - no. (col%, row%)	1,639 (20.24, 100.0)	624 (22.39, 38.07)	1,015 (19.11, 61.93)
Device related complications - no. (col%, row%)	1,492 (18.43, 100.0)	514 (18.45, 34.45)	978 (18.41, 65.55)

The above estimates were calculated using total number of explant cases. A patient could contribute more than one explant but not more than one per visit.

Conclusions

In this large, retrospective analysis, multiple causes of SCS explantation with associated cost were analyzed. Further attention will need to be focused on minimizing infection and device related complication as two of the most common reasons for removal with significant impact on healthcare resource utilization.

Table 3. Healthcare costs explanted vs. non-explanted

	Total Patients	Patients Receiving Explant/Revision	Did Not Receive Explant
Total Annual Healthcare cost - no. (col%, row%) (US \$)	12,327 (100.0, 100.0)	2,456 (100.0, 19.92)	9,871 (100.0, 80.08)
mean (SD)	28,723.9 (45,788.32)	47,613.6 (64,467.74)	24,023.9 (38,387.89)
median (IQR)	11,187.0 (3,057.4 - 39,786.0)	25,733.6 (7,941.4 - 63,579.8)	8,825.6 (2,595.7 - 33,710.7)
n (Min - Max)	12,327.0 (-42,979.7 - 92,747.8)	2,456.0 (0.0 - 65,515.8)	9,871.0 (-25,171.3 - 1,015,070)

All costs shown in USD adjusted for inflation...