Executive Summary in Support of Spinal Cord Stimulation for Failed Back Surgery Syndrome and Targeted Intrathecal Drug Delivery for Noncancer Pain

Chronic Pain Is a Costly Public Health Problem

- Chronic pain that lasts beyond the expected healing time or longer than 3 months\(^1\) afflicts at least 110 million Americans, more than the total number affected by cancer, diabetes and heart disease combined.\(^2\)

- The Federal Government recognized that untreated and under-treated pain is a serious problem and mandated that the Institute of Medicine (IOM) convene a highly vetted, distinguished committee to analyze the problems caused by inadequate treatment of pain and make recommendations to improve the situation. The results were published by the Institute of Medicine (US) Committee on Advancing Pain Research, Care and Education as *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research.*\(^3\) Significant points included:
  
  - Chronic pain costs Americans up to $635 billion annually in medical treatment and lost productivity.\(^3\)

  - “To reduce the impact of pain and the resultant suffering will require a transformation in how pain is perceived and judged both by people with pain and by the health care providers who help care for them. The overarching goal of this transformation should be gaining a better understanding of pain of all types and improving efforts to prevent, assess, and treat pain.”

  - “For many patients cure may be unlikely,” according to IOM.

Chronic Pain Can Be “Frustratingly Difficult to Treat”

- Conventional medical management (CMM) for chronic pain consists of medications (including systemic opioids), regional anesthetic interventions, psychological therapies, rehabilitative/physical therapy, and complementary and alternative medicine.\(^3\)

- “A growing, deadly epidemic” of prescription medicine overdose deaths in the U.S.\(^4\) has made access to prescription systemic opioids more difficult, even for medically indicated chronic pain management. Among physicians, 29% of primary care and 16% of pain specialists report they prescribe opioids less often than they think appropriate because of possible regulatory repercussions.\(^5\)

- For patients who suffer intolerable side effects from oral opioids or whose pain is not relieved, few other treatment options exist.
• Spinal cord stimulation (SCS) and targeted intrathecal drug delivery (IDD) can be evaluated before implementation during a screening trial, and offer physician-controlled pain therapy that is safe, effective, and cost-effective.

• Patient satisfaction with SCS and IDD has been consistently high (Appendices II and VI).

**Spinal Cord Stimulation Is Effective and Cost-Effective in Treating Failed Back Surgery Syndrome**

A new groundbreaking Level 1, pivotal, Food and Drug Administration-supervised randomized controlled trial (RCT) compared high-frequency 10 kHz SCS to traditional low-frequency SCS. (See Appendix II)

- 10 kHz SCS produced profound and durable pain relief as well as functional improvement measured by validated instruments, such as the Oswestry Disability Index (ODI).
- The 1-year responder rate (≥50% pain reduction) for 10 kHz high-frequency SCS was 78.7% for both back pain and leg pain.
- Pain reduction for both traditional SCS and 10 kHz high-frequency SCS was between 44% and 69%.

• Previous RCTs demonstrated significantly better pain relief and improvement in health-related quality of life (HRQoL) for SCS compared with CMM. (See Appendix II)

• SCS treatment of FBSS resulted in significant functional improvements over baseline in pain intensity, sex life, sitting, social life, standing, traveling, and walking at 6 months compared with CMM. These improvements were maintained at 24 months. (See Appendix II)

• SCS was also significantly more successful than reoperation for FBSS, with 48% of SCS patients and only 12% of reoperation patients reporting ≥50% pain relief. Patients preferred SCS to reoperation and were less likely to require increased opioids. (See Appendix II)

• Pain relief with SCS has proved durable, with 60% of patients having pain relief after an average of 8.1 years. Over a 22-year period, the early success rate was 80% (328 patients), and the long-term success rate was 74% (243 patients).

• Numerous studies using actual costs or health economic modeling have found SCS to be cost-effective in treating FBSS (See Appendix III), with the breakeven point for SCS occurring at approximately 2.5 years after implantation.

• SCS is recommended in numerous clinical practice guidelines for treatment of FBSS. (See Appendix IV)
**Intrathecal Drug Delivery Is Effective and Cost-Effective in Treating Chronic Noncancer Pain**

- The independent and highly regarded ECRI Institute ([https://www.ecri.org/Pages/default.aspx](https://www.ecri.org/Pages/default.aspx)) found that IDD leads to clinically relevant pain relief for chronic noncancer pain, and is associated with a decrease in the amount of other drugs taken or in the proportion of patients taking other drugs. Additional evidence of IDD efficacy and of the therapy-limiting drawbacks of systemic opioids has continued to accumulate since the 2008 ECRI review (Appendix VI).

- Physician control of IDD has the potential to improve both safety and efficacy of long-term opioid therapy.

- Improvements in safety, efficacy, compliance, and cost can be achieved by reducing or eliminating concomitant oral opioids in patients treated with IDD for chronic pain. (See Appendices VI and VII)

- IDD patients were less likely than those taking oral opioids to discontinue treatment due to adverse events (8.9% vs. 22.9%, respectively) or insufficient pain relief (7.6% vs. 10.3%, respectively), according to a Cochrane review of thousands of patients. Additional evidence of IDD efficacy and of the therapy-limiting drawbacks of systemic opioids has continued to accumulate since the 2008 ECRI review (Appendix VI).

- IDD can reduce longitudinal costs (Appendix VII) compared to other routes of opioid delivery.

- IDD is recommended by numerous clinical practice guidelines (Appendix VIII).

**References**


THE EVIDENCE FOR SPINAL CORD STIMULATION IN FAILED BACK SYNDROME

The California guidelines are based on the Official Disability Guidelines (ODG), yet the proposed medical treatment utilization schedule (MTUS) diverges from the ODG. Notably absent from the MTUS but present in the ODG is a recommendation for the use of spinal cord stimulation (SCS) for treatment of failed back surgery syndrome (FBSS). Thus, MTUS reverses previous determinations as well as overlooking compelling new Level 1 evidence supporting SCS for FBSS.

This document contains appendices in support of the efficacy, safety, and cost-effectiveness of SCS for the treatment of failed back surgery syndrome.

- Appendix I – Abbreviations
- Appendix II – Prospective, Randomized Controlled Trials of the Efficacy of Spinal Cord Stimulation
- Appendix III – Cost-Effectiveness of Spinal Cord Stimulation
TARGETED INTRATECAL DRUG DELIVERY

The California guidelines are based on the Official Disability Guidelines (ODG), yet the proposed medical treatment utilization schedule (MTUS) diverges from ODG. Absent from MTUS but present in ODG is a recommendations for use of targeted intrathecal drug delivery (IDD) in treating chronic noncancer pain. Thus, MTUS reverses previous determinations as well as recent studies supporting the safety, efficacy, and cost-effectiveness of IDD.

For example, the independent and highly regarded ECRI Institute (https://www.ecri.org/Pages/default.aspx) found that IDD leads to clinically relevant pain relief for chronic noncancer pain, and is associated with a decrease in the amount of other drugs taken or in the proportion of patients taking other drugs.\(^1\) Additional evidence of IDD efficacy and of the therapy-limiting drawbacks of systemic opioids has continued to accumulate since that determination in 2008. Moreover, a Cochrane review of 26 studies involving a total of 4893 patients published in 2010 found that IDD patients were less likely than those taking oral opioids to discontinue treatment due to adverse events (8.9% vs. 22.9%, respectively) or insufficient pain relief (7.6% vs. 10.3%, respectively).\(^2\) Patient satisfaction with IDD therapy has remained consistently high.

Intrathecal drug delivery offers an alternative delivery system to systemic medication administration. Intrathecal drug delivery offers substantially decreased dosing compared to systemic administration, resulting in decreased cognitive impairment and constipation.

With the Food and Drug Administration approval of ziconotide in 2004, there is also a non-opioid intrathecal alternative for treating severe intractable pain.

This document contains appendices in support of using IDD to treat chronic noncancer pain.

- Appendix V – Abbreviations
- Appendix VI – Studies of the Efficacy of Targeted Intrathecal drug Delivery to Treat Chronic Noncancer Pain
- Appendix VII – Cost-Effectiveness of Targeted Intrathecal Drug Delivery
- Appendix VIII – Guidelines Supporting Targeted Intrathecal Drug Delivery in Treatment of Chronic Pain
I. ABBREVIATIONS

AE: Adverse event
BPI: Brief Pain Inventory
CMM: Conventional medical management, usually consisting of medications (including opioids), regional anesthetic interventions, psychological therapies, rehabilitative/physical therapy, and complementary and alternative medicine.
CRPS: Complex regional pain syndrome
EQ-5D: EuroQol-5D, a validated instrument for assessing quality of life.
FBSS: Failed back surgery syndrome
HF10: high-frequency 10 kHz SCS
HR-Qol: Health-related quality of life
HTA: Health technology assessment
ICER: Incremental cost-effectiveness ratio
IDD: Intrathecal drug delivery
INS: Implantable neurostimulator
MCS: Mental component summary
NICE: National Institute of Health and Clinical Excellence, part of Britain's National Health Service
ODI: Oswestry Disability Index, a validated instrument for evaluating the impact of disability, including intensity of pain, lifting, ability to care for oneself, ability to walk, ability to sit, sexual function, ability to stand, social life, sleep quality, and ability to travel.
PCS: Physical component summary
QALY: Quality adjusted life year
QoL: Quality of life
RCT: Randomized controlled trial
SCS: Spinal cord stimulation
SF-12: A standardized, validated short health survey
VAS: Visual analogue scale, commonly used to measure self-reported pain.
II. PROSPECTIVE, RANDOMIZED CONTROLLED TRIALS OF THE EFFICACY OF SPINAL CORD STIMULATION

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<td>Senza RCT</td>
<td>Pivotal, multicenter RCT comparing safety and efficacy of 10 kHz SCS to low-frequency SCS in 198 patients with back and leg pain</td>
<td>171 patients were successfully trialed and implanted. Participants averaged 13.6 yrs since diagnosis, 54.9 yrs of age; 86.6% had previous back surgery, and 88.3% were taking opioid analgesics. Mean baseline back pain was 7.6 + 1.2 and mean baseline leg pain was 7.3 + 1.4. At 12 mos, the responder rate was 78.7% for HF10 therapy and 51.3% for low-frequency SCS for both back and leg pain (P&lt;0.001). Average pain relief was greater for HF10 therapy than traditional SCS (P&lt;0.001). More than 2,500 patients have received HF10 therapy, some for over 4 years, with no evidence of safety issues regarding 10 kHz stimulation. With &gt;25,000 cumulative device implant months, there have been no device failures with HF10 therapy, including no lead or battery failures reported. Furthermore, there have been no reports of stimulation-related neurological deficits associated with HF10 therapy.</td>
<td>This is the first scientifically rigorous pivotal RCT study and the first to obtain a level 1 comparison of SCS devices. In this prospective RCT of patients with intractable back and leg pain for an average of 13 years, two-thirds of the HF10 patients achieved durable remission status with no paresthesias. Moreover, the data clearly indicate a direct correlation between remission status and improved function. Achieving remission may provide healthcare economic benefits as well. If alternative treatment trials and therapeutic interventions are unnecessary, ongoing healthcare costs are diminished. We believe this study positions &quot;remission in a majority of patients&quot; as the benchmark for pain management therapies.</td>
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A VAS score of ≤2.5 was defined as remission. At 12 mos, 68.5% of the HF10 patients achieved remitter status for back pain compared to 35.8% patients with traditional SCS (P<0.001).

Higher ODI scores were associated with higher back pain VAS scores at 12 mos (r=0.608, P<0.001). VAS scores were negatively correlated with both SF-12 Physical Component Summary (PCS) and Mental Component Summary (MCS) subscale scores at 12 mos. As such, higher SF-12 scores were associated with lower VAS scores (r=-0.477 PCS, -0.326 MCS, P<0.001 for both).

Classification as remitters or non-remitters was highly correlated with ODI (P<0.001) and SF-12 measures (P<0.001) at 12 mos.

| Al-Kaisy et al. 2013<sup>5</sup> | Prospective, multicenter, observational study of 72 patients with back and leg pain | Mean back pain was significantly reduced at 24 mos (8.4 ± 0.1 at baseline and 3.3 ± 0.3 at 24 mos; P<0.001), as was mean leg pain (5.4 ± 0.4 at baseline and 2.3 ± 0.3 at 24 mos; P<0.001).
86% of patients were taking some form of systemic opioid at baseline, and this was reduced to 57% at 24 mos (P<0.001). The mean dosage of oral morphine equivalents per patient decreased from 84 mg/day at baseline to 27 mg/day at 24 mos (P<0.001).
81% of patients reported they were satisfied or very satisfied with the HF10 SCS system, “Patients with chronic low back pain have shown a marked and sustained response to HF10 SCS treatment. After 24 months of treatment, both back pain and leg pain were significantly reduced. Patient function, opioid utilization, and sleep were markedly improved. No AEs related to the high-frequency stimulation itself were observed. The positive results of this large prospective trial are encouraging and should inspire further investigation of the role that HF10 SCS may play in treating chronic spinal pain and other chronic pain states.” |
and 88% of them would recommend or highly recommend it to others with similar pain. Adverse events were similar in type and frequency to traditional SCS. The most common events were pocket pain (8.4%), wound infection (6.6%), and lead migration (4.8%).

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<td>Tiede et al. 2012⁷</td>
<td>Prospective, multicenter study of 24 patients who underwent traditional SCS trial and then proceeded to a trial of 10 kHz SCS</td>
<td>Conventional SCS reduced pain by 55% from baseline; 10 kHz SCS reduced pain by 77%. Overall pain (8.68 to 2.03, P&lt;0.001) and back pain (8.12 to 1.88, P&lt;0.001) scores improved significantly with 10 kHz SCS. 88% (21/24) expressed a preference for 10 kHz SCS over conventional SCS. There were no serious AEs. 12% (3/25) patients experienced undesirable sensation or muscle spasm during 10 kHz SCS, which resolved with reprogramming.</td>
<td>10 kHz SCS significantly reduced overall and back pain in patients suffering from predominant back pain, without producing paresthesia.</td>
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<td>Van Buyten et al. 2012⁸</td>
<td>Prospective, multicenter European study of 72 patients with significant back pain implanted with a 10 kHz SCS system</td>
<td>Mean back pain (8.4 at baseline and 2.7 at 6 mos) and leg pain (5.4 at baseline and 1.4 at 6 mos) were both significantly reduced (P&lt;0.001). There was a median reduction of 78% in back pain and 83% in leg pain. Mean ODI values significantly decreased from 55 at baseline to 37 at 6 mos (P&lt;0.001), and 57% of patients improved by ≥14 points.</td>
<td>“The high-frequency SCS system appears to be efficacious in many back pain patients that fail to benefit from conventional stimulation. The number and types of AEs reported in this study were similar to those previously published for conventional SCS devices. The high-frequency system delivered substantial benefits and would be a valuable therapeutic option for this group of chronic pain sufferers in whom conservative medical management has failed.”</td>
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| Mean sleep disturbances significantly decreased from 3.7 at baseline to 1.3 at 6 mos ($P<0.001$).

Opioid use decreased from 86% of patients at baseline to 62%, and 38% completely eliminated opioids during follow-up.

85% of patients were satisfied or very satisfied with 10 kHz SCS and would recommend or highly recommend it to others with similar pain.

51 adverse events were reported in 38 patients (46%), most commonly pocket pain (31% of events), and lead migration (22% of events). 13 patients required re-interventions. |
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<td>Schultz, Webster, et al. 2012⁹</td>
<td>The safety and effectiveness of a new position-adaptive neurostimulator was compared with manually programmed SCS in this multicenter, prospective, randomized, crossover study of 79 patients.</td>
<td>85.5% of position-adaptive patients achieved improved pain relief with no loss of convenience or improved convenience with no loss of pain relief compared with traditional SCS. There was a statistically significant reduction in pain rating scores compared to baseline with both devices. Position-adaptive SCS required significantly fewer daily programming adjustments (41%, P=0.002) than SCS. Position-adaptive SCS resulted in functional improvements in comfort during position changes (80.3%), improved activity (69%), and improved sleep (47.9%). Uncomfortable sensations did not differ between groups. The incidence of device-related serious AEs was 3.9%. “Automatic position-adaptive stimulation is safe and effective in providing benefits in terms of patient-reported improved pain relief and convenience compared with using manual programming adjustment alone.”</td>
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<td>Kumar, Taylor, Jacques, et al. 2007¹⁰</td>
<td>In the prospective, multicenter PROCESS study, 100 patients with FBSS were randomized to CMM with or without SCS.</td>
<td>At 6 mos, 48% of patients in the SCS group vs. 9% in the CMM group had achieved pain relief (P&lt;0.001). At 24 mos, 47% of patients in the SCS group vs. 7% in the CMM group had sustained pain relief (P=0.02). At 24 mos, SCS patients had significantly improved quality of life measured by the SF-36 than CMM patients (P&lt;0.01). Significantly more patients achieved pain relief with SCS than CMM, and that relief was maintained over a period of 2 years. Furthermore, SCS patients also had significantly improved quality of life and functional improvement compared with CMM patients.</td>
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In the SCS group, QoL was significantly improved over baseline in dimensions of mental health, social functioning, vitality, general health, bodily pain, role-physical, and physical functioning.\textsuperscript{11}

The SCS patients achieved significant functional improvement measured by the ODI from baseline to 6 mos ($P<0.001$) and 2 yrs ($P=0.0002$) after treatment began.\textsuperscript{11}

| North, Kidd, Farrokhi & Piantadosi, 2005\textsuperscript{13} | 50 patients with FBSS who were eligible for repeat lumbosacral surgery were randomly assigned to SCS or reoperation. Patients could cross over to the alternative treatment if the initial treatment was unsatisfactory. | SCS was significantly more successful than reoperation ($P<0.01$). 47% of SCS patients and 12% of reoperation patients reported $\geq$50% pain relief. Patients initially in the SCS group were significantly less likely to cross over than those in the reoperation group (5 of 24 patients vs. 14 of 26 patient, $P=0.02$). Patients in the reoperation group increased opioids significantly more often than those in the SCS group ($P<0.025$). Activities of daily living and work status did not differ significantly for the two groups post-treatment. | “SCS is more effective than reoperation as a treatment for persistent radicular pain after lumbosacral spine surgery, and in the great majority of patients, it obviates the need for reoperation.” |
III. COST-EFFECTIVENESS OF SPINAL CORD STIMULATION

Terms Related to Cost-Effectiveness Analyses

Incremental cost effectiveness ratio (ICER): a ratio of change in costs to change in effects (e.g., quality-adjusted life year).

Quality-adjusted life year (QALY): a measure of effectiveness that encompasses both quality of life and survival, providing a consistent and common measure that healthcare funders can use to inform funding decisions.

Willingness-to-pay (WTP) threshold: a threshold above which treatments are no longer considered cost-effective. An ICER is meaningful with respect to this threshold, which is approximately £20,000-30,000 in the United Kingdom, €40,000 in Europe, and $50,000-100,000 in the United States. The probability of payers not paying for a therapy increases significantly with increases in the ICER.
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| Kumar et al. 2013\(^{15}\)   | Evaluated the cost-effectiveness of SCS vs. CMM alone in the Canadian healthcare system. 2012 Canadian dollars | **SCS vs. CMM (FBSS):**  
- 75% probability that SCS is cost-effective at a WTP of CAN$50,000  
- ICER of CAN$9,293/QALY | **SCS was more cost-effective than CMM in patients with FBSS.**  
The cost-effectiveness of SCS was well below the maximum WTP thresholds. |
| Huang et al. 2013\(^{16}\)   | Retrospectively studied 13,774 patients with SCS to analyze outcome measures (probability, timing and type of reoperation); postop complications, and overall health resources utilization. | Medicaid patients had greater healthcare resource utilization measured by medications prescribed, emergency department visits, and length of stay.  
Commercially insured patients had significantly higher overall costs ($110,908 vs. $64,644; P<0.0001).  
Commercial and Medicaid patients did not significantly differ in their complication rates during the index hospitalization, or at 30 or 90 days postoperatively.  
The groups were not significantly different in their 2-year reoperation rates (7.32% vs. 5.06%, P=0.0513). | There were substantial insurance disparities that affected healthcare utilization and overall cost for SCS. Commercially insured patients had significantly higher overall costs but their complication and reoperation rates did not differ significantly from those of Medicare patients.  
However, Medicare patients utilized more healthcare resources. |
| Hollingworth et al. 2011\(^{17}\) | Estimated cost-effectiveness of SCS among workers’ compensation recipients over 24 months. U.S. dollars | **Mean medical costs:**  
SCS - $52,091  
Pain clinic - $34,800  
Usual care - $23,963  
5% of SCS patients, 3% of pain clinic patients, and 10% of usual care patients achieved their primary goal at 24 months. | The reported cost savings of SCS may not be replicated in workers’ compensation within 2 years postimplantation. This finding is consistent with other studies that find the breakeven cost of SCS occurs at approximately 2.5 years post-implantation, at which time SCS becomes less expensive than CMM.\(^{18}\) |
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<td>Taylor et al. 2010(^{19})</td>
<td>Evaluated cost-effectiveness of SCS vs. medical management alone or reoperation in patients with FBSS.</td>
<td>Decision analytic cost-utility model developed by the Institute of Health and Clinical Excellence; 15-year horizon British pounds</td>
<td>SCS vs. CMM:</td>
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<td>• 89% probability that SCS is cost-effective at a WTP of £20,000</td>
<td>• 98% probability at a WTP of £30,000 ICER of £5,624/QALY</td>
<td>SCS was more cost-effective than CMM or reoperation in patients with FBSS. The cost-effectiveness of SCS was well below the maximum WTP thresholds.</td>
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<td>SCS vs. reoperation:</td>
<td>• 82% probability that SCS is cost-effective at a WTP of £20,000 ICER of £6,392/QALY</td>
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<td>• &gt;95% probability at a WTP of £30,000 ICER of £9,155/QALY</td>
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<td>Simpson et al. 2009(^{20})</td>
<td>Explored the cost-effectiveness of SCS in the treatment of chronic pain in the U.K. up to 15 years postimplantation. British pounds</td>
<td>SCS vs. CMM: • 80% probability that SCS is cost-effective at a WTP of £20,000</td>
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<td>• &gt;95% probability at a WTP of £30,000 ICER of £9,155/QALY</td>
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<td>SCS dominated CMM and reoperation as the most cost-effective option when device longevity was &gt;7 years. SCS achieved “economic dominance” by conferring better treatment success and more QALYs at a lower cost than alternative treatments.</td>
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<td>SCS vs. reoperation: • 90% probability that SCS is cost-effective at a WTP of £20,000 ICER of £7,954/QALY</td>
<td>• 98% probability at a WTP of £30,000 ICER of £7,954/QALY</td>
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| North et al. 2007<sup>21</sup> | Analyzed cost-effectiveness of SCS vs. reoperation. Hospitalization and professional charges tracked over 4 years for 40 of 50 patients in a prospective RCT. U.S. dollars. | **Mean per-patient cost** (intention-to-treat analysis):  
SCS - $31,530  
Reoperation - $38,160  
**Treatment cost:**  
SCS - $48,357 (7/14 patients)  
Reoperation: $105,928 (2/8 patients)  
**Mean per-patient cost for patients who crossed from original treatment:**  
Reoperation to SCS - $117,901 (5/13 patients)  
SCS to reoperation - $260,584  
**SCS vs. reoperation:**  
- 72% probability that SCS is cost-effective at a WTP of $40,000  
SCS was more effective and less expensive than reoperation. Failed reoperation followed by SCS was more expensive than starting with SCS and later choosing reoperation. |
| Kumar et al. 2006<sup>22</sup> | Calculated actual healthcare costs for complications of SCS in 160 consecutive patients over 10-years; 51 complications occurred in 42 patients. 2005 Canadian dollars. | **Mean cost for SCS implantation:**  
$23,205/patient  
**Mean annual maintenance cost** (uncomplicated case): $3,609, including INS replacement every 4 years  
**Mean cost to rectify a complication** over a 10-year period: $7,092 (range $130 to $22,406)  
**Mean cost to explant an SCS system:** $1,739  
Preventing or reducing complications through advancements in technology and methodology helps reduce the cost of SCS. |
| Kumar et al. 2002<sup>18</sup> | Calculated actual 5-year costs for treating FBSS with SCS (n=60) or medical management alone (n=44). Canadian dollars. | **Mean total and (annual) costs:**  
SCS - $29,123 ($5,825/yr)  
CMM - $38,029 ($7,606/yr)  
Higher costs in the CMM group reflect greater use of healthcare resources (medications, rehabilitation, other pain-control therapies). At 2.5 years the costs of SCS became less than for CMM. |
## IV. GUIDELINES AND LEVELS OF EVIDENCE

### Spinal Cord Stimulation in Treatment of Failed Back Surgery Syndrome

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| 2014 International Neuromodulation Society, Neuromodulation Appropriate... | Recommends the use of SCS early in the treatment algorithm for FBSS in the absence of neurological progression requiring semi-urgent intervention  
Evidence strength I; recommendation strength A<sup>24</sup>                                                                                     |
| 2013 Guideline from South African Spine Society, the Neurological Society of South Africa, and the South African Society of Anaesthesiologists<sup>23</sup> | Evidence from RCTs supports the use of SCS for pain from FBSS. SCS is more effective for radicular (limb) pain following spinal surgery than either reoperation or management by nonsurgical therapy. |
| 2013 Evidence-Based Guidelines for Interventional Techniques in Chronic Spinal Pain<sup>26</sup> American Society of Interventional Pain Physicians | Evidence is fair for SCS in managing patients with FBSS                                                                                                                                                        |
| 2013 International Association for the Study of Pain<sup>27</sup>           | Recommends SCS for FBSS  
Quality of evidence: moderate  
Strength of recommendation: weak                                                                                                                     |
<p>| 2012 Accident Compensation Corporation New Zealand&lt;sup&gt;28&lt;/sup&gt;             | Recommends SCS for patients with persistent and disabbling radicular pain following FBSS who have not responded to CMM after at least 6 months                                                                 |
| 2012 Special Interest Group of the Canadian Pain Society&lt;sup&gt;29&lt;/sup&gt;       | Consider SCS trial in FBSS patients who are not candidates for corrective surgery and have failed more conservative evidence-based treatment                                                                      |
| 2011 Australasian Neurostimulation Working Group&lt;sup&gt;30&lt;/sup&gt;              | SCS may be considered for the management of certain types of neuropathic pain, including FBSS, in selected patients, after initial care has failed and pain has persisted for a prolonged period (e.g., &gt;6 months) |
| 2011 Australian and New Zealand College of Anaesthetists&lt;sup&gt;31&lt;/sup&gt;      | SCS may be considered in patients with FBSS who have undergone comprehensive multidisciplinary assessment and management and in whom conservative treatment has failed |</p>
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<td>2011</td>
<td>National Institute for Health and Clinical Excellence, Britain’s National Health Service</td>
<td>Recommends SCS treatment for adults with chronic pain of neuropathic origin including FBSS</td>
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<td>2011</td>
<td>Transport Accident Commission &amp; WorkSafe Victoria, Australia</td>
<td>Moderate evidence that SCS relieves pain within 5 years in persistent pain conditions, including FBSS. Low-level evidence that SCS improves function and quality of life in 5-10 years</td>
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<td>2010</td>
<td>Washington State Health Care Authority Health Technology Assessment</td>
<td>“Spinal cord stimulation for chronic neuropathic pain is <strong>not a covered benefit.</strong>”</td>
</tr>
<tr>
<td>2009</td>
<td>American Pain Society</td>
<td>In patients with persistent and disabling radicular pain following surgery for herniated disc and no evidence of a persistently compressed nerve root, it is recommended that clinicians discuss risks and benefits of SCS as an option (weak recommendation, moderate-quality evidence). It is recommended that shared decision-making regarding SCS include a discussion about the high rate of complications following spinal cord stimulator placement.</td>
</tr>
<tr>
<td>2007</td>
<td>Neurromodulation Therapy Access Coalition, Practice Parameters for the Use of Spinal Cord Stimulation</td>
<td>Recommends SCS for FBSS Quality of evidence: grade A</td>
</tr>
<tr>
<td>2007</td>
<td>European Federation of Neurological Societies</td>
<td>SCS is efficacious in FBSS (level B recommendation)</td>
</tr>
</tbody>
</table>
References

1 Institute of Medicine (US) committee on Advancing Pain Research, Care and Education. Relieving Pain In America: A Blueprint for Transforming Prevention, Care, Education, and Research. Washington DC: The National Academies Press; 2011.


31 *Neuromodulation (Spinal Cord Stimulation) in the Management of Patients with Chronic Pain.* Australian and New Zealand College of Anaesthetists; 2011.


V. ABBREVIATIONS

CMM: Conventional medical management, usually consisting of medications (including opioids), regional anesthetic interventions, psychological therapies, rehabilitative/physical therapy, and complementary and alternative medicine. ³

CRPS: Complex regional pain syndrome

CSF: Cerebrospinal fluid

EQ-5D: EuroQol-5D, a validated instrument for assessing quality of life.

FBSS: Failed back surgery syndrome

HR-QoL: Health-related quality of life

HTA: Health technology assessment

ICER: Incremental cost-effectiveness ratio

IDD: Intrathecal drug delivery

IT: Intrathecal

IV: Intravenous

MPQ: McGill Pain Questionnaire

NICE: National Institute of Health and Clinical Excellence, part of Britain’s National Health Service

NPR: Numerical pain rating, used to measure self-reported pain. See also VAS.

ODI: Oswestry Disability Index, a validated instrument for evaluating the impact of disability, including intensity of pain, lifting, ability to care for oneself, ability to walk, ability to sit, sexual function, ability to stand, social life, sleep quality, and ability to travel.

QALY: Quality adjusted life year

QoL: Quality of life

QUALEFFO: Questionnaire of the European Foundation of Osteoporosis

RCT: Randomized controlled trial

TDD: Targeted drug delivery

VAS: Visual analogue scale, commonly used to measure self-reported pain. See also NPR.
## VI. STUDIES OF THE EFFICACY OF TARGETED INTRATHECAL DRUG DELIVERY TO TREAT CHRONIC NONCANCER PAIN

### Prospective Studies

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<th>Study Details</th>
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<th>Conclusions</th>
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<tr>
<td>Hamza et al.</td>
<td>Long-term follow-up of 61 consecutive patients with IDD for severe intractable noncancer pain. Assessed by Brief Pain Inventory</td>
<td>58 patients were implanted. Significant decrease in worst and average pain from baseline to 36 mos ($P=0.012$ and $P&lt;0.001$, respectively). Significant improvement in physical and behavioral function. Significant reduction in oral opioid consumption. IT opioids were 1.4 morphine equivalents/day at 6 mos and 1.48 at 36 mos.</td>
<td>“Low-dose opioids can provide sustained significant improvement in pain and function for long-term follow-up in chronic noncancer pain.”</td>
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<tr>
<td>Grider et al.</td>
<td>22 patients underwent systemic opioid taper and a 5-week opioid-free period before IDD trial. Following a successful IDDS trial during week 6, patients remained opioid-free for 10 to 14 days before permanent implantation and never resumed systemic opioid therapy thereafter.</td>
<td>A year after implantation the VAS for pain was significantly lower (7.3 ± 1.9 before opioid taper, 7.15 after opioid-free period, and 3.9 ± 2.6 a year postimplant), and function, evaluated by physical and occupational therapists, had improved. Analgesia was maintained with microgram doses, with a dose-response relationship for effective analgesia of ≤400 µg IT morphine; most patients achieved analgesia with doses in the 100 to 200 µg range.</td>
<td>Lower effective intrathecal doses would be expected to enhance patient safety.</td>
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<td>Duse et al.</td>
<td>30 patients with MPQ improved 66%, the effective component 59%, and the The reduced level of chronic pain</td>
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<tr>
<td>Year</td>
<td>Study Description</td>
<td>Results</td>
<td>Notes</td>
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<td>2009</td>
<td>chronic pain unresponsive to CMM were weaned off opioids before trialing IDD.</td>
<td>leads to improved social, work, and family relationships and quality of life. 92% of working age patients returned to full-time work, and 82% of retirees required less assistance.</td>
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<td>Patients filled out the McGill Pain Questionnaire and VAS before and after implant at 3, 12, and 24 mos.</td>
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<td>VAS improved by 55%. Average morphine infusion rate increased to 0.80 ± 0.45 mg/day at the 24-mos follow-up (P&lt;0.05).</td>
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<td>12 of 13 patients returned to work full-time, and 14 of 17 retirees required less assistance with 8 no longer requiring live-in assistance.</td>
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<td>Shaladi et al. 2007</td>
<td>24 patients with vertebral fractures due to osteoporosis received IDD. Evaluation was by VAS and the Questionnaire of the European Foundation of Osteoporosis (QUALEFFO) 1 yr postimplant.</td>
<td>Significant pain relief and improved function was noted 1 yr after IDD implant. “Continuous intrathecal administration of morphine appears to be an alternative therapy to conventional analgesic drug delivery and has advantages in those patients who have severe side effects with systemic administration of analgesics.”</td>
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<td>VAS declined from 8.7 pretrial to 1.9 at 1 yr postimplant. QUALEFFO dropped from 114.7 to 79.1, with significant improvements in domestic work, ambulation, and perception of health status. Mean IT morphine dose at 1 yr was 16.32 mg/day. Patients reported improved function and satisfaction with therapy, and required no systemic opioid medications. Complications included 1 wound infection and 1 delayed wound healing.</td>
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<td>Thimineur et al. 2004&lt;sup&gt;8&lt;/sup&gt;</td>
<td>88 candidates with severe pain who had not responded to conservative therapy underwent an 3-day inpatient trial for IDD. After trial, 3 groups of patients were formed: IDD patients (n=44), non-IDD (CMM) patients (n=44), and newly referred patients who agreed to be in the study (n=59). Patients were followed every 6 mos for 3 yrs.</td>
<td>At 3 yrs 38 patients remained in the IDD group, 31 in the non-IDD group, 41 in the referred group. At 3 yrs, VAS had decreased by 27% in the IDD group (P&lt;0.000001) and increased by 7% in the non-IDD group (P&lt;0.01). Anxiety had improved significantly in the IDD group (P&lt;0.001) and worsened significantly in the non-IDD group (P&lt;0.01). Depression, measured by a depression scale and inventory, had improved significantly in the IDD group (P&lt;0.001 and P&lt;0.01, respectively) and worsened significantly in the non-IDD group (P&lt;0.01 and P&lt;0.001, respectively). Disability had improved significantly in the IDD patients (P&lt;0.01) and had worsened significantly in the non-IDD patients (P&lt;0.05), although physical functioning had not changed significantly in either group. In contrast to the non-IDD group, all the newly referred patients had significantly improved for all the measured parameters (P&lt;0.000001). 2 patients in the IDD group had pump pocket infections requiring removal and replacement after antibiotic therapy. Catheter revision was necessary in 1 patient, and another had IDD removal due to transverse myelitis at the catheter tip. IDD significantly improved pain, function, and mood, while non-IDD patients deteriorated despite escalation of oral opioids. At 3 yrs, the average daily oral morphine dose had significantly decreased in the IDD group and increased in the referred group. IDD for noncancer pain should be considered appropriate when other conservative medical management options have been exhausted.</td>
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</table>
Of the 166 patients, 66.2% suffered from FBSS, 36.8% from degenerative disc disease, and 28.7% from radicular leg pain. Patients with back surgeries had undergone an average of 2.8 procedures.

Of the 166 patients who underwent trial, 136 (82%) patients had implantation of an IDD system.

At the 6- and 12-mos follow-up evaluations, pain had decreased significantly both for back and leg pain ($P<0.001$) compared to baseline.

At 12 mos, back pain had declined by 48% and leg pain by 32%.

At 6 and 12 mos, improvement in functional abilities had occurred in 60% and 66% of the patients, respectively.

At baseline, 30% of the IDD patients had minimal-to-moderate disability and 60% of them had severe disability. At 6 and 12 mos, 65% and 73% of the IDD patients had minimal-to-moderate disability, respectively, and 30% and 22% of them had severe disability, respectively.

At baseline, 54.5% of the IDD patients (total n =134) were not working, 25.4% were retired, 9% had a status of not working, 7.5% of them were working at reduced capacity or hours due to pain, and 3.7% were working.

At 12 mos, 68.1% of the IDD patients (total n=47) remained at the same work status, 21.3% had a better work status, and 10.6% had a lower work status.

At baseline, 88.2% of the IDD patients (total n =154) were taking systemic opioids. At 12 mos 42.5% of them (total n=75) had decreased or ceased their use of systemic opioids.

At the 12-mos evaluation, 60 of 75 (80%) IDD patients stated...
that they were satisfied with this therapy and 65 (87%) said that they would have IDD again.

Adverse events occurred in 23 of the 154 (14.9%) patients with IDD. Of these, 21 required some surgery to correct the problem. Adverse events included infection (2.2%), catheter dislodgement (1.5%), catheter fracture (0.7%) and reaction to medication (5.1%).

| Rainov et al. 2001<sup>10</sup> | 26 patients with FBSS failed CMM and received IDD for infusion of various combinations of morphine, bupivacaine, clonidine, or midazolam. | VAS was maintained up to 2 yrs postimplant, with 8% to 50% pain improvement.
Most patients reported improvement in walking ability, reduced systemic pain medications, and sleep.
Mean daily morphine dose, alone or in combination, was 6.2 ± 2.8 mg morphine, 2.5 mg ± 1.5 mg bupivacaine, 0.06 mg ± 0.03 mg for clonidine, and 0.8 mg ± 0.4 mg for midazolam.
73% rated long-term treatment as excellent or good. | Intrathecal polyanalgesia employing morphine alone or in combination with nonopioids can have a favorable and sustained analgesic efficacy in patients with complex chronic pain of spinal origin, with lack of major drug-related complications. |
<table>
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<tr>
<th>Study</th>
<th>Study Details</th>
<th>Findings</th>
<th>Conclusions</th>
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<tr>
<td>Caraway et al. 2015&lt;sup&gt;21&lt;/sup&gt;</td>
<td>Single-center retrospective review of 99 consecutive patients with IDD for at least 6 mos</td>
<td>The study population averaged 67 years of age, was 68% female, and 77% were Medicare beneficiaries. Ninety-five percent of patients had low back pain and 86% had limb pain. The majority (81%) had experienced chronic pain for &gt;5 years. Previous failed treatments included epidural injections (74%), lumbar spine surgery (46%), SCS (14%), and facet joint injections (11%), with 84% also reporting significant systemic opioid side effects. All patients previously taking long-acting opioids discontinued these within 1 mos of implant. Total systemic opioid elimination was accomplished by 68% of patients at 1 mos postimplant, 84% at 1 yr, and 92% at 5 yrs. At 1 mos, 60% of patients reported decreased pain (mean score change: -4.07) and at 1 yr, 64% did (mean score change: -3.42).</td>
<td>IDD can provide significant and lasting pain relief and an alternate route of delivery compared to systemic opioids with their associated side effects. Systemic opioid elimination can be accomplished in the majority of cases through appropriate patient selection, monitoring, and participation.</td>
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<tr>
<td>Atli et al. 2010&lt;sup&gt;12&lt;/sup&gt;</td>
<td>Of 57 patients initially treated with IDD, 43 were available for 3-yr follow-up. Pain ratings (VAS) and systemic opioid consumption were evaluated.</td>
<td>VAS reduced from 7.7 at baseline to 5.7 at 3 yrs. Systemic opioid consumption fell from 183 mg/day morphine equivalents to 57.6 mg/day. IT doses gradually increased from 6.5 mg/day to 12.2 mg/day. Preimplant opioid consumption inversely correlated with treatment success.</td>
<td>IDD produced long-term pain reduction, and decreased systemic opioid consumption by almost half.</td>
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<td>Staats et al. 2007&lt;sup&gt;13&lt;/sup&gt;</td>
<td>Review of 101 patients from 8 centers with IDD for low back pain for at least 2 yrs</td>
<td>Most pumps had morphine (47.7%). 34% had single-medication therapy, 35.6% had 2-medication therapy. Preimplant pain score in 89 patients was 7.7. Refill visits averaged every 1.5 months. 89% had daily morphine no greater than 25 mg/day, 56.9% had concentration of &lt;25 mg/cc. 94% had constant flow treatment, maintained from between 1-3 mos and &gt;30 mos postimplant.</td>
<td>Many patients with nonmalignant low-back pain could use a constant-flow pump, either as a replacement or to initiate IDD therapy. This would reduce cost and the need for replacement surgery.</td>
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<td>Doleys et al. 2006&lt;sup&gt;14&lt;/sup&gt;</td>
<td>3 groups of patients with FBSS were followed for &gt;3 yrs: 50 had an implanted IDD system, 40 completed a 4-wk residential pain and rehabilitation program, and 40 received CMM (oral opioids).</td>
<td>Pretreatment pain measured by NPR was significantly greater in the IDD group (P&lt;0.001). Nonetheless, after treatment NPRs decreased 35.5% in the IDD group, 8% in the rehabilitation group, and 8.5% in the CMM group (P&lt;0.001). The percentage of patients working at follow-up was 26% in the IDD group, 23% in the rehabilitation group, and 10% in the CMM group. Treatment was rated “good” or “excellent” by 88% of the IDD patients, 51% of the rehabilitation patients, and 97% of the CMM patients, with the IDD and CMM groups differing significantly from the rehabilitation group (P&lt;0.001).</td>
<td>IDD therapy for noncancer pain produced the greatest improvement overall in pain reduction and work status.</td>
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</table>
Raphael et al. 2002 15

| Raphael et al. 2002 15 | Retrospective study of 36 IDD patients with low back pain (LBP) or FBSS for ≥6 mos. | Of the 36 patients, 12 had LBP and 24 had FBSS, with a median of 2 spinal operations (range 1-11) per patient. The 36 patients had the IDD system for a mean of 4.38 ± 3.03 yrs (0.5 - 9.0). All patients received intrathecal diamorphine, and 32 had bupivacaine, 27 clonidine, and 3 baclofen. The NPR improved significantly in both the LBP (by 33%) and FBSS (by 47%) groups (P<0.005). QoL improved significantly in the FBSS group (P<0.005), except for work interruption and the effect of pain on sex life. The same measures had changed in the LBP group, but not significantly. Of the 15 patients under age 50, none were working before IDD therapy, but 4 (27%) returned to work after implantation. The median number of doctor visits per month in the FBSS group decreased significantly from 2.24 pre-IDD to 0.72 post-IDD (P<0.05), and in the LBP group from 2.07 pre-IDD to 0.90 post-IDD. 26 patients responded that IDD was very worthwhile, 5 that it was quite worthwhile, and 3 that it was adequate. Complications required 10 revision surgeries, 3 for catheter problems, 4 for pump position problems, 2 for infection, and 1 for CSF leak. | “We have found an improvement in pain and range of quality of life measures over a prolonged time averaging 4.38 years (range 0.50–9.00 years). Tolerance to intrathecal opioids does not appear to be a significant problem and the use of bupivacaine and clonidine together with diamorphine is without complications and appears to have an opioid-sparing effect. Revision surgery especially for catheter-related problems continues to be a common problem with the current technology, but complication rates in our study were dependent upon operator and unit experience.” |
| Roberts et al. 2001<sup>16</sup> | Retrospective study of 88 patients with chronic noncancer pain. Effectiveness was assessed by self-reported pain relief (NPR), change of activity levels (5-point scale), satisfaction with IDD (6-point scale), and current use of medications. | 55 of the 88 patients had FBSS, with a mean of 4 spinal surgeries (range, 1–18 surgeries). Questionnaires were returned by 67 patients (80% of those alive) at a mean follow-up period of 36.2 ± 2.4 mos. Pain relief was ≥50% in 40 of 49 (82%) patients, with the mean pain relief in the 49 patients being 60.0%. Activity levels had increased in 36 of 49 (74%) patients. Work status of the 49 patients remained unchanged. Current use of analgesic medications by 48 patients declined significantly (P<0.0001). Of 51 reporting patients, 43 (84%) patients were very or moderately satisfied, 2 (4%) were slightly satisfied, and 3 (6%) patients were very or moderately dissatisfied with IDD. At least 1 procedure to correct a surgical problem was necessary in 32 of the 81 (40%) patients. Catheter complications included dislodgement (12/81, 15%), nerve root irritation (3, 4%), occlusion (8, 10%), and disconnection (10, 12%). The pump was repositioned in 5 (6%) patients, and replaced in 8 (10%) due to pump malfunction. Other complications included wound hematoma in 1 (1%) patient, wound infection in 5 (6%) patients who were treated with oral antibiotics, and meningitis in 1 (1%) patient, leading to IDD removal, IV antibiotic treatment, and IDD replacement. | The majority of patients treated with IDD had pain relief and increased activity levels, and their use of analgesic medications declined significantly. Patient satisfaction with IDD therapy was high. |
VII. COST-EFFECTIVENESS OF TARGETED INTRATHecal DRUG DELIVERY

Terms Related To Cost-Effectiveness Analyses\textsuperscript{17}

Incremental cost effectiveness ratio (ICER): a ratio of change in costs to change in effects (e.g., quality-adjusted life year).

Quality-adjusted life year (QALY): a measure of effectiveness that encompasses both quality of life and survival, providing a consistent and common measure that healthcare funders can use to inform funding decisions.

Willingness-to-pay (WTP) threshold: a threshold above which treatments are no longer considered cost-effective. An ICER is meaningful with respect to this threshold, which is approximately £20,000-30,000 in the United Kingdom, €40,000 in Europe, and $50,000-100,000 in the United States. The probability of payers not paying for a therapy increases significantly with increases in the ICER.
### Targeted Intrathecal Drug Delivery for Failed Back Surgery Syndrome or Chronic Noncancer Pain

<table>
<thead>
<tr>
<th>Study</th>
<th>Study Details</th>
<th>Actual/Estimated Costs</th>
<th>Conclusions</th>
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| Hatheway et al. 2015¹⁸ | Claims data from commercial and Medicare databases were searched for patients who had an IDDS, used systemic opioids before implant, and had 12 months pre- and 13 months postimplant continuous medical and pharmacy coverage.  
389 patients met inclusion criteria and 51% completely eliminated systemic opioids (12% within the 30-day washout and an additional 39% by the end of the 1-year horizon).  
Systemic opioid elimination within 120 to 210 days postimplant was associated with a reduction of $3,388 to $4,465 in inpatient and outpatient expenditures, and $4,689 to $5,571 in inpatient, outpatient, and drug expenditures. | Complete elimination or systemic opioids resulted in a 10% to 17% reduction in yearly inpatient, outpatient and drug expenditures.  
“Given the enormous personal and societal burden of chronic pain, the quality of life, safety, economic, and public health incentives for eliminating or decreasing systemic opioid use deserve consideration.” |                                                                                                                                                                                                                       |
| Guillemette et al. 2013¹⁹ | Analyzed claims data to evaluate the economic effects of IDD vs. CMM based on health services utilization and costs of care before and after IDD implantation.  
A retrospective database study of 555 noncancer pain patients who received an IDD system within a 3-yr period standardized over a 6-yr cycle (3 yrs pre- and 3 yrs post-implant  
First yr postimplant costs were $17,317 more for IDD than CMM.  
IDD breakeven occurred soon after the second yr postimplant.  
Lifetime savings were $3,111 per yr for IDD vs. CMM. | The cost breakeven point for IDD vs. CMM occurred soon after the second year postimplant. Subsequent lifetime savings were >$3,000 annually for IDD vs. CMM. |                                                                                                                                                                                                                       |
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<tr>
<th>Study</th>
<th>Description</th>
<th>Results</th>
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<tr>
<td>Kumar et al. 2013&lt;sup&gt;20&lt;/sup&gt;</td>
<td>Used a Markov model to derive quality-adjusted life years (QALYs) gained in a comparison of IDD with CMM and calculate costs in 2011 CAN dollars.</td>
<td><strong>10-yr total costs:</strong>&lt;br&gt;IDD: $61,442&lt;br&gt;CMM: $48,408&lt;br&gt;ICER: 1.1508 QALY at incremental cost of $13,034&lt;br&gt;ICER/QALY gained: $11,326&lt;br&gt;50% to 84% probability of IDD providing a cost-effective alternative to CMM at a WTP of $14,200/QALY and $20,000/QALY, respectively.</td>
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<td>Kumar et al. 2002&lt;sup&gt;21&lt;/sup&gt;</td>
<td>Calculated the actual 5-yr health care costs in year 2000 Canadian dollars for 23 FBSS patients who had IDD and 44 matched FBSS patients who had CMM. Accumulative cost data for the IDD group included pump replacement due to battery depletion in the 5th year.</td>
<td><strong>Mean cumulative costs:</strong>&lt;br&gt;IDD: CAN $29,410 ($5,882/yr)&lt;br&gt;CMM: CAN $38,000 ($7,600/yr)&lt;br&gt;<strong>Mean cumulative costs:</strong>&lt;br&gt;With complications: CAN $31,131&lt;br&gt;No complications: CAN $28,264&lt;br&gt;The initially higher cost for IDD than for CMM would have been recovered by 28 mos. Thereafter, the cost of CMM would have exceeded the cost of IDD, in spite of pump replacement in the 5th year.</td>
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<tr>
<td>Study</td>
<td>Methodology/Description</td>
<td>Cost Calculations</td>
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<td>de Lissovoy et al. 1997(^{22})</td>
<td>Used a decision analytic model to estimate direct healthcare costs in 1994 US dollars for patients with FBSS, who had IDD or CMM over a 60-mos period. Costs were projected for a simulated cohort of 1,000 patients with FBSS, based on insurer paid claims discounted at a 5% annual rate.</td>
<td><strong>Base case values, expected 60-mos total cost:</strong>&lt;br&gt;IDD: $82,893 ($1,382 per mos)&lt;br&gt;Best case: $53,468 ($891 per mos)&lt;br&gt;Worst case: $125,102 ($2,085 per mos)&lt;br&gt;CMM: 60-mos total cost $85,186 ($1,573 per mos)&lt;br&gt;Cumulative cost estimates for IDD would be less than for CMM after 22 mos in the base case and after 11 mos in the best case. Moreover, the cumulative cost for IDD would never be less than that for CMM in the worst case, averaging $665 more per mos.</td>
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<tr>
<td>Hassenbusch et al. 1997(^{23})</td>
<td>Estimated 1-yr costs in US dollars (year unstated) for 15 patients who had IDD and 5 patients who had epidural drug delivery from an external system. Of the 15 IDD patients, 8 had noncancer pain and 7 had cancer pain. The 5 epidural drug delivery patients had cancer pain.</td>
<td>1-year costs:&lt;br&gt;IDD: $21,368&lt;br&gt;External system: $34,938.&lt;br&gt;At 3 mos:&lt;br&gt;IDD: $16,316&lt;br&gt;External system: $15,606&lt;br&gt;At 6 mos:&lt;br&gt;IDD: $18,362&lt;br&gt;External system: $22,050</td>
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<td>Bedder et al. 1991(^{24})</td>
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### VIII. GUIDELINES

#### Intrathecal Targeted Drug Delivery in Treatment of Chronic Pain

<table>
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<tr>
<th>Guideline</th>
<th>Recommendation</th>
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<tr>
<td>Institute for Clinical Systems Improvement 2013(^{25})</td>
<td>Referral for placement of an intrathecal pump may be made for patients with chronic pain who have failed more conservative treatment options and have not met the goals of comfort/pain control and function.</td>
</tr>
<tr>
<td>Polyanalgesic Consensus Conference Guidelines 2012(^{26})</td>
<td>“Intraspinal (intrathecal) infusions of opioids and other analgesic medications have been used increasingly since the late 1980s for the treatment of chronic pain that is refractory to conventional therapies. Recent technological advances have enhanced the safety and reliability of implantable drug delivery systems and have permitted further clinical testing of established medications, drug admixtures, and novel analgesic compounds.”</td>
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<tr>
<td>Practice Guidelines for Chronic Pain Management 2010(^{27})</td>
<td>Intrathecal opioid injection or infusion may be used for neuropathic pain patients. Ziconotide infusion may be used in the treatment of a select subset of patients with refractory chronic pain. Neuraxial opioid trials should be performed before considering permanent implantation of intrathecal drug delivery systems.</td>
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<td>American Society of Anesthesiologists, and American Society of Regional Anesthesia and Pain Medicine</td>
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<td>Consensus Guidelines for the Selection and Implantation of Patients with Noncancer Pain and Intrathecal Drug Delivery 2010(^{28})</td>
<td>IT drug delivery is indicated for neuropathic pain syndromes, radicular pain from FBSS, CRPS, phantom limb syndrome, osteoporosis, pancreatitis, and compression fractures. No existing comorbidity is an absolute contraindication for IT therapy.</td>
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<tr>
<td>Chou et al. 2009(^{29})</td>
<td>“Chronic opioid therapy can be an effective therapy for carefully selected and monitored patients with chronic noncancer pain.”</td>
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<td>British Pain Society 2008(^{30})</td>
<td>“Intrathecal drug delivery can be an effective method of pain control; it has a supportive evidence base.” “In the opinion of the working group, IDD is an underused technique in all three categories of chronic nonmalignant pain, cancer pain and spasticity and should be made more widely available.”</td>
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<tr>
<td>Source</td>
<td>Text</td>
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<tr>
<td>ECRI Institute 2008 review for Washington State(^1)</td>
<td>IDD leads to clinically relevant pain relief for chronic noncancer pain, and is associated with a decrease in the amount of other drugs taken or in the proportion of patients taking other drugs.(^1)</td>
</tr>
<tr>
<td>Australian and New Zealand College of Anaesthetists 2005(^2)</td>
<td>“1.4 Intrathecal drug administration is an established and often effective method of pain management in a small subgroup of patients with cancer and persistent non-cancer pain. 1.5 Intrathecal treatment may provide a unique opportunity to directly target central sensitization associated with cancer and persistent non-cancer pain.”</td>
</tr>
</tbody>
</table>
References


30 The British Pain Society. Intrathecal Drug Delivery for the Management of Pain and Spasticity in Adults; Recommendations for Best Clinical Practice. 2008.
August 30, 2015

Re: Public Comment Regarding Proposed MTUS Guidelines
Division of Workers’ Compensation

As a former two-term member of the Medical Evidence Evaluation Advisory Committee (MEEAC) and a full-time practicing pain physician at a major California academic medical center, I submitted comments to this site regarding the proposed changes to the Medical Treatment Utilization Schedule (MTUS), in December 2014. In April I joined numerous colleagues who treat chronic pain in presenting a letter and supporting evidence (see attached) asking that spinal cord stimulation (SCS) for failed back surgery syndrome (FBSS), and intrathecal therapy for specific pain problems continue to be covered in California. I appreciate the changes made to preserve this effective treatment, which were endorsed by

The American Society of Anesthesiologists,
The American Society of Interventional Pain Physicians,
The North American Neuromodulation Society,
The California Society of Anesthesiologists,
The California Society of Interventional Pain Physicians,
The California Society of Industrial Medicine, and

an administrator at every academic pain program in the State of California.

Coverage of SCS for FBSS allows workers in California to join those in the 48 other states in being eligible for effective treatment of their chronic back pain. In addition, SCS for FBSS is covered by Medicare and most commercial health insurers.

While the MTUS changes are gratifying, they continue to cite 2004 recommendations made by the American College of Occupational and Environmental Medicine (ACOEM) that may lead to ambiguities. The ACOEM Practice Guidelines, 2nd ed., which are cited by MTUS in the LOW...
Back Complaints section (regulations 9792.23.5), state: “Implantable spinal cord stimulators are rarely used and should be reserved for patients with low back pain for more than six months duration who have not responded to the standard nonoperative or operative interventions. (Chap. 12, p. 307).” This statement is false in light of the past 10 years of evidence and clinical practice.

The 2004 ACOEM source predates more than a decade of subsequent clinical studies of SCS in the management of chronic pain associated with FBSS. Most importantly, it overlooks the recent, landmark SENZA study of high-frequency SCS (HF10) therapy that provides a scientifically rigorous, pivotal, Level 1 comparison of HF10 and SCS. More than two-thirds of the HF10 patients achieved back and leg pain remission over 12 months. This result is remarkable, given that 86.6% of the patients had undergone previous failed back surgery, and patients averaged 13.6 years since their pain diagnosis. Follow-up now extends to 18 months and demonstrates that the benefits of HF10-SCS therapy are durable.

With this new evidence in mind, it is difficult to justify not including the April literature summary of SCS for FBSS presented to the DWC in regard to the proposed guidelines. The summary includes numerous clinical trials of SCS conducted since 2004, and would give the public, insurers, and physicians an opportunity to evaluate what is known today about SCS for FBSS.

Although the new proposed guideline includes coverage for intrathecal therapy, it is important to note that there is a reference in the ODG that is negative about the merits of intrathecal therapy. This reference cites guidelines from the State of Washington. Washington is the only state that denies this coverage and did so in contradiction to the findings of a highly respected independent body (ECRI Institute) it had commissioned to evaluate the evidence.

Attached to this letter, are several PDFs. These PDFs represent work product that was presented to the DWC earlier this year. Although the cover letter addresses some issues that are no longer of concern, it describes the layout of the work product that follows. An executive summary was provided that discusses the issues in general and subsequently explains the layout of the succeeding documents. These documents include an executive summary, a summary of the evidence, and finally an evidence table and bibliography that supports the summary of the evidence.

As a physician with decades of experience treating injured workers in California, I believe our chronic pain patients deserve the best care that clinical science and medicine currently offers. My remaining concerns relate to possible ambiguities in wordings, discussed above, that could compromise the ability of injured workers in California to receive care potentially leaving them in the same situation as patients in Washington, the only state in the country that denies these therapies to the injured worker as a matter of policy.

Sincerely,
Joshua P Prager, M.D., M.S.
Director, The Center for Rehabilitation of Pain Syndromes at UCLA Medical Plaza
Departments of Internal Medicine and Anesthesiology
David Geffen School of Medicine at UCLA
Diplomate, American Board of Internal Medicine
Diplomate, American Board of Anesthesiology
Diplomate, American Board of Pain Medicine
April 24, 2015  
Division of Workers’ Compensation  
PO Box 420603  
San Francisco, CA 94142

We are writing on behalf of a group professional societies representing thousands of pain treatment specialists regarding the Division of Workers’ Compensation (DWC) proposed Chronic Pain Medical Treatment Guidelines posted on December 8, 2014. The proposed medical treatment utilization schedule (MTUS) language contradicts the Official Disability Guidelines (ODG) on which it is based. The current MTUS is the result of the work of the Medical Evidence Advisory Committee (MEEAC), a vetted group of professionals appointed by the state of California who worked in an iterative fashion with ODG to develop these evidence based guidelines. The new proposed new MTUS ignores this evidence based work as well as new, high-quality, compelling evidence that supports coverage of spinal cord stimulation (SCS) for failed back surgery syndrome (FBSS) and intrathecal drug delivery (IDD) systems for non cancer pain. We respectfully request that you rescind the proposed guidelines that removes coverage for treatments for which there is subsequently published evidenced based studies published in peer-reviewed journals that provide additional evidence that supports the recommendations of the prior MTUS with regard to both the efficacy and cost-effectiveness of these therapies for pain.

According to the independent and authoritative recent Institute of Medicine (IOM) report on Pain in America, chronic pain is a costly public health problem that requires:

“a transformation in how pain is perceived and judged both by people with pain and by the health care providers who help care for them. The overarching goal of this transformation should be gaining a better understanding of pain of all types and improving efforts to prevent, assess, and treat pain.”

To that end, our members are acutely aware that removing effective, Food and Drug Administration-approved treatment options from patients with chronic pain clashes with our professional ethics and robs patients of approved, effective, and established therapies.

In support of our request, please consider the accompanying documents:

- An Executive Summary that reviews the burden of chronic pain, treatment options, and briefly presents the evidence for using SCS and TDD in appropriately selected patients with chronic pain that is contained in the extensive peer-reviewed literature summaries in Appendices II, III, VI, and VII.
- Peer-Reviewed Literature Summaries (Appendices II, III, VI, VII) that amply support the efficacy, safety, and cost-effectiveness of both SCS and TDD.
- Current Clinical Practice Guidelines (Appendices IV, VIII) are provided that include SCS and TDD.

As pain treatment specialists, we thank you for the opportunity to re-present prior and present recent data that emphasize the vital role of SCS and IDD in the treatment of chronic pain. We hope you understand that since the current MTUS was published subsequent data have supported its conclusions and absent compelling data to the contrary there is no rationale for change.

Sincerely,
Endorsements from California University Medical Centers:
Lawrence Poree, MD, PhD  
Assistant Professor, Anesthesia 
Professor  
University of California, San Francisco

Jaimie M. Henderson, MD  
John and Jene Blume—Robert and Ruth Halperin 
Department of Neurosurgery  
Stanford University School of Medicine
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