Low Back Pain: From Algorithm to Cost-Effectiveness?

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Abstract: Low back pain is one of the most important burdens for the patient, the health-care provider, and society. Treatment selection should target the appropriate use of the available health-care resources with the highest probability of success. When conventional treatment fails to provide satisfactory pain reduction and improvement of the quality of life, more interventional techniques can be envisioned. The degree of invasiveness of the different treatment modalities varies as well as the costs. A stepwise approach to chronic low back pain may reduce the economic burden with optimal use of the less invasive treatments. In this review, we discuss the treatment algorithm with special attention to the interventional pain management techniques. We also describe the results of a cost evaluation for the management of low back pain in Belgium compared with that in the Netherlands, two neighboring countries with different social security systems.

Key Words: low back pain, treatment algorithm, cost-effectiveness, interventional pain management

INTRODUCTION

In Low Back Pain: A Twentieth Century Health Care Enigma, Waddell highlighted in 1996 the growing dissatisfaction with health care for low back pain in the U.S.A., which he described as specialist oriented, and in the U.K., where health care is underfunded. Almost 10 years later, we still struggle with the appropriate use of the available health-care resources for administering the treatment that has the highest probability for success.

Nearly everyone at some point experiences back pain that interferes with work, daily routine activities, or recreation, but only a portion of the population will suffer chronic low back pain. Spitzer estimated that 8% of the patients who have an acute episode of low back pain will develop chronic low back pain. However, these figures, suggesting a spontaneous resolution of the problem, have been questioned. The considerable variation found in the literature regarding the incidence of chronic low back pain may be attributed to variation in its definition. An extensive literature review indicates that at 6 months, 16% are still sick listed, while 62% of the patients continued to experience pain at 12 months following initial diagnosis. The mean reported prevalence of low back pain in cases with previous back pain episodes was 56% compared to 22% for those without a prior history of low back pain.

The available treatment options can be subdivided in four major categories: conservative (pharmacological and physical treatment), cognitive rehabilitation programs, interventional, and surgical management techniques. Interventional and surgical techniques should only be considered when pharmacological treatment supplemented with physical exercise failed to provide adequate relief or induced unacceptable side effects. In the present era of evidence-based medicine, the best available level of evidence should guide our therapeutic choices.
CHRONIC PAIN AND ITS MANAGEMENT

It is well established that pain is a complex physical, psychosocial, ethnncultural, affective–cognitive, and environmental phenomenon. Because no single treatment can influence all these aspects of pain, medical management must blend the appropriate therapeutic modalities into a coordinated program that addresses the identified mechanism(s) for the pain. The logical goals of acute pain management are to eliminate pain and to restore the patient’s ability to function as rapidly as possible. When the pain has become chronic, its total eradication may be unrealistic because of the multiple contributing components previously mentioned in its perpetuation. Realistic objectives in this clinical situation are to decrease the pain as much as possible, to help the patient cope with residual pain and to encourage maximal function. A multidisciplinary approach to chronic pain has been advocated as an alternative to the traditional fragmented approach.⁴

Chronic pain is managed by a stepwise approach using first the conservative treatment options to their full extent, followed by an increasingly invasive treatment complemented by psychological guidance and rehabilitation programs. The algorithm is often represented as a ladder, adapted from the World Health Organization ladder for cancer pain management, whereby the pharmacological treatment is the cornerstone, and the interventional techniques are progressively introduced. The stepwise approach to the management of chronic low back pain is illustrated in Figure 1.

THE EVIDENCE FOR INTERVENTIONAL PAIN MANAGEMENT TECHNIQUES

Randomized controlled trials (RCTs) generate the best proof of efficacy compared with either placebo or sham intervention, or the best alternative available. Conducting this type of trial for interventional pain treatment options is difficult for both practical and ethical reasons. Where RCTs are available, there may be conflicting outcome results that can be attributed to the study methodology, patient selection, and end-point definition.

We performed a literature review for the different interventional pain treatment options.

Epidural steroid administration is a minimally invasive technique that aims to suppress local inflammation. A treatment cycle usually consists of two to three infiltrations administered on an ambulatory basis in the day clinic. The value of performing this intervention under fluoroscopic guidance has been stressed in the international literature.

Currently, there are 12 published RCTs. Meta-analyses of these trials have resulted in conflicting recommendations. McQuay and Moore⁶ illustrated efficacy in the treatment of sciatica, whereas the Cochrane Library⁷ showed no evidence of efficacy for epidural steroid administration.

The transforaminal (periradicular/sleeve) infiltration allows the precise application of corticosteroids to the irritated nerve root. In an RCT where the transforaminal injection of bupivacaine was compared with bupivacaine and betamethasone in patients considered to be surgical candidates and where failure was defined as

**Figure 1.** An algorithm for the management of chronic noncancer pain. (From Pain Pract. 2002;2:269–278.)
operative treatment, 33% of the patients who received bupivacaine alone, compared with 71% of those treated with bupivacaine and bethamethasone, did not undergo surgery at 13 to 28 months follow-up. In contrast, another RCT comparing periradicular administration of bupivacaine and methylprednisolone with saline administration noted a rebound effect in the active group at 3 and 6 months after the intervention. A subgroup analysis of the same data, separating the patient population into a group with “contained” disc herniation and a group with “extrusion,” revealed a lower operation rate at 1 year in the active group compared with the placebo group in patients with contained herniation. The opposite result was seen in the group with extrusion.

Radiofrequency treatment was initially performed as a full neurodestructive procedure, but improvements in technique, needles, and apparatus now allow a target-selective intervention. Recently, Sluijter et al. developed a nondestructive or at least minimally neurodestructive technique whereby the electrical current is delivered in a pulsed fashion (20 msec on and 480 msec off; pulsed radiofrequency [PRF]), thus allowing time between cycles for the heat to be “washed out.” Radiofrequency treatment is also performed under fluoroscopic guidance on an ambulatory basis in the day clinic.

There are currently two systematic reviews on radiofrequency treatment. Both reviews come to similar conclusions, namely, that there is moderate evidence that radiofrequency lumbar facet denervation is more effective for chronic low back pain than is placebo. Limited evidence exists for the efficacy of radiofrequency neurotomy in chronic cervical zygapophyseal joint pain after whiplash. There is limited evidence that radiofrequency heating of the dorsal root ganglion is more effective than placebo in chronic cervicobrachialgia.

**Pulsed Radiofrequency**

The use of PRF treatment has been documented in case reports. A clinical audit evaluating the efficacy of PRF adjacent to the cervical dorsal root ganglion for the management of cervicobrachialgia and cervicogenic headache indicated that initial pain relief, 6 to 8 weeks after the procedure, was obtained in 72% of the patients. Fifty-six percent of the patients maintained >50% pain relief for a period of 3 to 11 months, and 33% rated the treatment outcome as good for more than 1 year. The Kaplan–Meier curve of the probability of successful treatment as a function of time illustrates that 50% of patients experienced a successful result at 3 months following treatment. A prospective cohort outcome study of PRF for lumbar radiculopathy considered the underlying causation. Patients with herniated disc and spinal stenosis had pain relief for more than 6 months, while PRF treatment was not effective in the group with failed back surgery syndrome (FBSS).

**Radiofrequency Heat Lesioning of the Intervertebral Disc**

Direct lesioning of the disc with an intradiscal radiofrequency procedure for 90 seconds at 70°C was compared with sham. The authors concluded that radiofrequency thermocoagulation is not effective in reducing chronic discogenic low back pain. In another randomized trial, the results of the intradiscal procedure at 80°C for 120 seconds and for 360 seconds were compared. There were no differences between the outcomes of the two treatment groups. Alternative methods of producing a thermal lesion in the lumbar intervertebral disc have also been described. In one approach, a flexible catheter (SpineCATH, Oratec) was introduced into the nucleus of the disc and allowed to curl posteriorly at the interface between the annulus and the nucleus. The initial results indicated that radiofrequency heating of the annulus might also be effective. These findings led to the development of a flexible radiofrequency electrode (disc-TRODE, Radionics, Valleylab, Boulder, CO, U.S.A.). This electrode is introduced into the posterior annulus under radiographic control and steered purposefully between the lamellae across the target annular fissure.

Only one randomized, placebo-controlled trial using the SpineCATH has been published. That study indicated that intradiscal electrothermal therapy appears to provide worthwhile relief in a small proportion of strictly defined patients.

Adhesiolysis aims to eliminate the deleterious effects of scar tissue, which can physically prevent the direct application of drugs to nerves or other tissues, by assuring delivery of high concentrations of injected drugs to the target areas. This procedure is also performed with fluoroscopy during brief hospitalization. The clinical effectiveness of percutaneous adhesiolysis was evaluated in two clinical trials. Satisfactory pain relief was achieved in one of the two trials.

Epiduroscopy has been reported to offer an ideal combination of a diagnostic and therapeutic interven-
tion in one session, overcoming disadvantages of earlier epidural administration techniques. Furthermore, it may be a more sensitive tool to detect the presence of lumbar nerve root pathology, along with fibrosis and adhesions not shown with standard imaging techniques. Local adhesiolysis can be performed at the same time. In a prospective trial, epiduroscopy was shown to be of value in the diagnosis of spinal root pathology. In radicular-pain patients, adhesions not visible with magnetic resonance imaging have been identified. Targeted epidural medication administered near the compromised spinal nerve results in substantial and prolonged pain relief.21 Another prospective trial comparing the outcome of patients with monosegmental and multisegmental symptoms indicated clear improvement in the visual analog scale (VAS) for back pain in both groups at 12 months. Improvement was reported in the VAS for leg pain in the monosegmental group at 12 months and in the multisegmental group at 3 months.22

Epidural neurostimulation (spinal cord stimulation) uses electrical stimulation of the spinal cord. The stimulation electrode is connected to an implanted pulse generator after satisfactory pain relief is obtained during a trial period. Pain reduction is achieved in the area where the stimulation generates a tingling sensation. The implantation of the electrode is carried out during a brief hospitalization. Afterwards, the patient is followed up at regular intervals for evaluation and adjustment of the generator, making the patient a “lifetime patient.”

Three RCTs on neurostimulation are available, two in FBSS23,24 and one in chronic regional pain syndrome (CRPS),25 showing better outcome than back surgery and conventional treatment, respectively. In a recent review of the evidence, Carter26 stated: “Although 50–60% of patients with failed back surgery syndrome obtain significant pain relief with this technique, the strength of the evidence available is insufficient to clearly advocate its use in all patients with this condition.” The Cochrane review27 came to a similar conclusion, adding that there was a need for a debate about trial designs that would provide better evidence. A systematic review and analysis of prognostic factors concluded that the evidence for efficacy remains moderate. The prognostic factors found to be predictive of the level of pain relief following spinal cord stimulation were study quality, follow-up duration, study setting, and patient indication.28

Intrathecal administration of medication by means of an implantable pump requires an intrathecally implanted catheter subcutaneously connected with the implanted infusion pump. Different pump types with dramatic differences in cost are currently on the market. As with supportive care services (SCS), the patient remains a lifetime patient, as the adjustment and filling of the pump require regular visits to the pain clinic.

There are no RCTs for this treatment option; therefore, it is only used as rescue therapy. A consensus report describes the potential value of this treatment.29 A long-term prospective study illustrated the best results in patients with FBSS. Morphine dosing had to be increased in all patients treated for more than 2 years.30 Significant endocrinological side effects have also been reported.31

**Surgery**

Different surgical interventions are used for the treatment of spinal stenosis, instability, and degenerative spondylolisthesis.

The Cochrane review,32 which was last updated in May 2000, concluded that there was no scientific evidence regarding the effectiveness of any form of surgical decompression or fusion for degenerative lumbar spondylolisthesis compared with natural history, placebo, or conservative treatment. In a randomized trial, the Swedish lumbar spine study group compared three commonly used lumbar fusion techniques, primarily in terms of their ability to reduce pain and decrease disability, in patients with severe chronic low back pain.33 This study found that all of the fusion techniques reduced pain and improved function in this selected group of patients with severe chronic low back pain. The same research group compared lumbar fusion with nonsurgical treatment for chronic low back pain in a multicenter RCT34 and demonstrated that, in a well-informed and selected group of patients with severe chronic low back pain, lumbar fusion can diminish pain and decrease disability more efficiently than commonly used nonsurgical treatment. A recent single-blind randomized study compared lumbar-instrumented fusion with cognitive intervention and exercise in patients with chronic low back pain and disc degeneration. They found no differences in outcome between the two approaches.35

**PHARMACOECONOMIC STUDIES OF INTERVENTIONAL PAIN MANAGEMENT TECHNIQUES**

Ideally, economic evaluation should be incorporated into the protocol for RCTs. Those evaluations provide
a solid base for judging the benefit offered by a novel pharmacological treatment, as the new treatment can be compared in a blinded fashion with the “best alternative.” However, this comparison is very difficult when dealing with interventional pain management techniques because (1) sham intervention requires the same equipment as the real intervention and, consequently, is as expensive; (2) comparison with the “best alternative” means comparing interventional treatment with pharmacological or physical treatment where blinding is impossible; and (3) the complexity of the pathology requires a stepwise approach within a multidisciplinary setting.

Those burdens are reflected in the number of pharmacoeconomic studies reported in the literature.

None of the studies evaluating the efficacy of conventional epidural steroid administration included a pharmacoeconomic evaluation. A subgroup analysis of the RCT of the Karppinen study on the transforaminal approach indicated that in patients with contained disc herniation the surgery rate is considerably reduced, resulting in cost savings of $12,666 per responder.

There are currently nine published RCTs on radiofrequency treatment. Critical reviews indicated that there is limited evidence that radiofrequency is more effective than placebo. There are no economic evaluations pertaining to this technique.

The clinical effectiveness of percutaneous adhesiolysis was evaluated in two clinical trials. One of these trials was randomized and included a cost-effectiveness evaluation that demonstrated an important cost reduction per year of improvement in the quality of life.

Two RCTs for neurostimulation are available, one in FBSS and one in CRPS as previously discussed. The available economic evaluations suggest that the high costs during the first year of treatment can only be justified after a prolonged period of pain relief. Two recent publications further discuss the economic aspect of spinal cord stimulation. A systematic review of the literature illustrates that in the medium to long term (ie, 1 to 3 years), spinal cord stimulation is economically favorable in comparison with other therapies for patients with FBSS, angina pectoris, and CRPS. The initial acquisition costs of SCS appear to be offset by a reduction in health-care resources such as drug therapy, physician’s visits, and hospitalization. A case record review of patients with spinal cord stimulation or peripheral nerve stimulation for the management of intractable chronic neuropathic pain generated similar conclusions.

There are no RCTs for the intrathecal drug delivery systems with implantable pumps. A consensus report describes the potential value of this treatment. As with neuromodulation, the majority of the costs are concentrated in the first months, implying that this technique will be cost-effective if the patient’s life expectancy exceeds 3 months for cancer pain and 22 months for noncancer pain. The actual costs in Canadian dollars in a consecutive series of patients undergoing intrathecal drug administration, compared with costs in a control group in the same environment, were registered. Over a 5-year follow-up period, the actual cumulative cost for intrathecal drug administration was $29,410 as opposed to $38,000 for conservative treatment. The high initial costs of equipment required for intrathecal drug administration were recovered in 28 months.

The cost-effectiveness of spine surgery was evaluated in the Swedish RCT comparing surgery with conventional conservative treatment. The 2-year costs related to surgery, society, and the health-care sectors were significantly higher compared with nonsurgical treatment, but all treatment effects significantly favored surgery. The probability of lumbar fusion being cost-effective increased with the value put on extra-effect units gained by using surgery.

**MEDICAL TECHNOLOGY ASSESSMENT**

Chronic low back pain has a wider economic impact than cost of treatment alone. Moreover, no single treatment option thus far has been proven superior to all the others. The management of chronic low back pain requires integrated, multidisciplinary care. Therefore, relying solely on pharmacoeconomic studies to judge the value of a treatment has several shortcomings.

Medical technology assessment (MTA) may be a better alternative to the evaluation methods described above. In MTA, careful and systematic evaluation and linkage of the numerous facets of a health-care issue are performed to determine their full impact, to assess the state of the art and rational use of health-care services, and to support and guide medical decision making. The conceptual framework described by Tugwell et al. included etiology, quantification of the burden of illness, assessment of therapeutic effectiveness, and economic evaluation of therapies (Figure 2).

With this philosophy in mind, we studied the question: Are the higher costs involved with the multidisciplinary management of low back pain, as compared with the fragmented approach, justified by a reduction in costs for society?
Incidence and Prevalence of Low Back Pain in Belgium

In a prevalence survey, a representative sample of the Belgian population was asked regarding the occurrence of low back pain during the past 6 months. Six percent of the population reported suffering from chronic low back pain. These data concur with the epidemiological data from other countries described in the literature. It has been demonstrated that this group uses 75% of the total health-care budget for the management of low back pain.46,47

Economic Costs of Low Back Pain in Belgium

Employers are legally obliged to continue to pay the salary of employees on sick leave. Data from IDWE (Externe Dienst voor Preventie en Bescherming op het Werk) indicate that 29% of the total number of sick-leave days are attributable to low back pain. Although no costs for the replacement of the sick employee could be calculated, the total costs for employers and RIZIV amount yearly to €992.6 million. Yearly in Belgium, 5.7 million days of absenteeism are paid because of low back pain. The information regarding the loss of income, patient costs for assistance and supportive tools, and the costs of care by family and relatives is not available and could not be taken into consideration.

TREATMENT COST OF LOW BACK PAIN

Pharmacological treatment consists of non-narcotic analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs), and narcotics. Institute for Medical Statistics data allowed tracking the number of prescriptions issued for low back pain within the different therapeutic classes. NSAIDs are the most frequently used drugs in this setting with over 1,200,000 prescriptions filled yearly. We estimated that on average two products were prescribed during a doctor’s visit, adding €14.5 million to the €20.1 million budget for drugs. The total yearly expense of €34.7 million for the pharmacological treatment of low back pain is underestimated, because the use of coanalgesics (antidepressants and antiepileptics) for the management of neuropathic pain could not be traced. Moreover, the use of over-the-counter painkillers for low back pain has not been included in the available data sources.

Physical therapy and rehabilitation is considered the second step in the conservative management of low back pain. In 1999, there were 3 million physiotherapeutic consultations and 41 million consultations performed by kinesitherapists. A point-prevalence study (personal communication, Stappaerts Katholieke Universiteit Leuven, Belgium, 1999) indicated that 80% of the consultations with kinesitherapists are carried out for the locomotor apparatus. Seventy percent of the consultations for pain emanating from the spine were due to pain emanating from the lower spine. The total yearly cost was estimated at €114.5 million.

Transcutaneous electrical nerve stimulation (TENS) involves the application of external electrodes to the painful area of the skin. These external electrodes are connected to the pulse generator (a portable battery-operated device). The patient can purchase the device after a successful trial period. A survey conducted in the Ziekenhuis Oost-Limburg (S. Maninfior, 2000) found that 55% of the TENS prescribed are used for the management of low back pain. This means that of the 2000 devices sold yearly in Belgium 1100 are used for low back pain. The test period usually requires three consultations. The price of the generator is €297, while the electrodes cost €124 per year. The global cost for TENS treatment amounts to €514,769.

Epidural steroid administration purportedly reduces nerve root inflammation by injecting drug as close as possible to the causative structure within the epidural space. The intervention is usually performed in a day...
care hospital. A survey reported that in Belgium 50,000 epidural steroid injections are performed yearly, and each treatment course consists of an average of 2.4 infiltrations. Considering that 70% of the interventions are carried out for the management of low back pain, we estimate that 14,583 patients receive a treatment cycle with epidural steroids. Each treatment cycle starts with an intake consultation, and the patient is seen once after finishing treatment. The cost of this treatment option can be split into honoraria, day care hospital fixed costs, medication, and consultation amounting to a total of €4.6 million.

Radiofrequency treatment was used for the treatment of 2040 patients in 1999. The code used for tracking data does not allow discrimination between the different techniques and approaches of other target nerves, obliging us to assume a 70 : 30 distribution for low back pain. The costs for this management consist of specialists’ honoraria, medication, fixed budget for the day care hospital or hospitalization cost, medical consultations, and the cost for the diagnostic blocks. In Belgium, radiofrequency treatment costs €394,434 yearly. Radiofrequency treatment requires an investment in equipment, the generator, and the thermocouple electrodes. The global yearly investment for Belgium, based on the sales figures from suppliers, are estimated to be €178,483. In Belgium, those investments are currently completely carried by the hospitals.

Surgery is indicated for decompression of disc herniation with associated neurological deficit and for patients with degenerative disease of the lumbar spine associated with instability, spinal stenosis, and degenerative spondylolisthesis. There are two types of spine surgery—with and without arthrodesis. Arthrodesis uses implants for the fusion of two or more vertebrae. Surgery without arthrodesis was performed 12,899 times in 1999. The total duration of hospital stay was 138,587 days, and each surgical intervention required four medical consultations. The total yearly cost for surgery of the lumbar spine without arthrodesis amounted to €39.3 million. Surgery with arthrodesis was performed 3198 times. In addition to the costs of hospitalization and consultation, the cost for the implants amounted to €8.3 million. The health-care budget attributed to surgery with arthrodesis was €21.1 million. The global surgery budget for the management of low back pain, the medications used during surgery, and the patient contributions were not included.

Epidural neurostimulation is based on the gate theory, whereby electrodes are applied to the dorsal column and connected to an implanted pulse generator. Permanent implantation is preceded by a trial period. The best results are obtained in the management of pain restricted to well-delineated regions. Epidural neurostimulation is reimbursed in Belgium for the management of FBSS. The cost for treatment with epidural neurostimulation include evaluation, epidural implantation of the electrodes for the trial stimulation, the trial period, the permanent implantation, hospitalization, the costs of implanted electrodes that do not result in a permanent implantation, the price of the stimulator, medical physician and psychiatrist/psychologist consultations, and the patient contribution. In Belgium, there were 233 neurostimulator implantations for FBSS in 1999 and one-third of these cases were revisions or replacements. The total cost for the year was €2.1 million.

Intrathecal administration of medication by means of an implanted pump has an advantage in that, because the opioids bind directly to the opiate receptors in the dorsal horn, lower doses are required for pain relief. In the case of chronic pain management, an implanted intrathecal catheter connected to an implanted infusion pump provides for continuous intrathecal administration. Permanent implantation is also preceded by a trial period with an external pump. During this trial period, the mode of delivery and the combination and doses of medications are adjusted to achieve optimal pain control. In 1999, 137 pumps were implanted in Belgium. We have assumed that 60% were used for the management of FBSS; thus, 82 pumps may have been implanted for the management of low back pain. As with the neurostimulator, the patient pays a portion of the costs. The total cost for the management of low back pain with implantable pumps is €573,309. As in other implantable therapies, the patient must return regularly to the pain center for the refilling of the pump. The direct cost of the medications and the associated consultation could not be evaluated because of the variability in drug combinations and dosages.

Cognitive behavioral treatment is considered to be effective in the management of certain types of patients suffering from low back pain. The frequency of use and the cost of this treatment option could not be evaluated, because there is no official registration for this treatment option.

The global cost for the management of low back pain in Belgium is illustrated in Table 1.

Those figures underestimate the real cost because:
The personal contribution of the patient could not be completely traced.

The amount spent on alternative treatments are not included.

The costs of psychological treatment could not be evaluated.

The description of the different (interventional) pain management techniques is not accurate in the official registry.

The management of chronic low back pain following accidents in the workplace is not accounted for in the official statistics.

The interventional treatment options account for approximately 20% of the total budget spent on the management of low back pain, 85% of which is attributed to surgery. The distribution of the costs for interventional pain management is illustrated in Table 2.

Algorithms for the management of chronic pain clearly prefer the use of the least invasive and least expensive procedures first. Only when those treatment options fail will the more invasive and more expensive treatments be considered. The more invasive procedures should be used in an interdisciplinary environment with appropriate attention given to psychosocial counseling and rehabilitation. During the last decennium, there has been increased attention paid to the multidisciplinary management of low back pain. According to Waddell,1 “An historic review shows that there is no change in the pathology or prevalence of low back pain in the United States and the United Kingdom, although neither delivers the kind of care recommended by recent evidence based guidelines. Medical care for low back pain in the United States is specialist-oriented, of high technology, and of high cost, but 40% of American patients seek chiropractic care for low back pain instead. Despite the different health care systems, treatment availability, and costs, there seems to be little difference in clinical outcomes or the social impact of low back pain in the two countries. There is growing dissatisfaction with health care for low back pain on both sides of the Atlantic. Future health care for patients with nonspecific low back pain should be designed to meet their specific needs.” This describes precisely the role of the multidisciplinary pain centers.

Comparing pain management in two countries with completely different health-care systems, Waddell’s remark led to the comparison of the costs for managing low back pain in Belgium with those from the Netherlands. Authorities in these countries demonstrated considerable interest in chronic pain, stimulating and funding the development of multidisciplinary pain centers. The use of interventional pain management techniques is reimbursed when well-defined protocols are followed. Those initiatives led to the development of structured coordinated approaches to chronic pain within a multidisciplinary treatment environment. The comparison of the frequency of use of the different techniques between the two countries is illustrated in Table 3.

### Table 1. Costs for the Management of Low Back Pain Belgium, 1999

<table>
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<tr>
<th>Conservative treatment</th>
<th>Total Cost</th>
<th>% Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication</td>
<td>34,717</td>
<td>18.56</td>
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<tr>
<td>Rehabilitation</td>
<td>114,528</td>
<td>61.24</td>
</tr>
<tr>
<td>TENS</td>
<td>515</td>
<td>0.28</td>
</tr>
<tr>
<td>Total conservative treatments</td>
<td>149,759</td>
<td>80.08</td>
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<tr>
<td>Nonsurgical interventional treatments</td>
<td>7,707</td>
<td>4.12</td>
</tr>
<tr>
<td>Surgery</td>
<td>29,539</td>
<td>15.80</td>
</tr>
<tr>
<td>Total</td>
<td>187,005</td>
<td>100</td>
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</tbody>
</table>

TENS, transcutaneous electrical nerve stimulation.

### Table 2. Distribution of the Costs for Interventional Pain Management in Belgium, 1999

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Number of Patients</th>
<th>Total Cost $€ \times 10^3$</th>
<th>% Cost</th>
<th>Cost per Patient $€$</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENS</td>
<td>1,100</td>
<td>515</td>
<td>1.36</td>
<td>468</td>
</tr>
<tr>
<td>Epidural steroid injections</td>
<td>14,583</td>
<td>4,605</td>
<td>12.20</td>
<td>316</td>
</tr>
<tr>
<td>Radiofrequency treatments</td>
<td>1,428</td>
<td>394</td>
<td>1.04</td>
<td>276</td>
</tr>
<tr>
<td>Epidural neuromodulation</td>
<td>233</td>
<td>2,134</td>
<td>5.65</td>
<td>9,160</td>
</tr>
<tr>
<td>Intrathecal drug administration</td>
<td>82</td>
<td>573</td>
<td>1.52</td>
<td>6,992</td>
</tr>
<tr>
<td>Surgery without arthrodesis</td>
<td>12,899</td>
<td>8,448</td>
<td>22.37</td>
<td>655</td>
</tr>
<tr>
<td>Surgery with arthrodesis</td>
<td>3,198</td>
<td>21,091</td>
<td>55.85</td>
<td>6,595</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>37,760</td>
<td>100</td>
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TENS, transcutaneous electrical nerve stimulation.
The use of medication is 33% lower in the Netherlands than in Belgium. The exact figures regarding physical therapy and kinesitherapy could not be obtained. A stepwise approach is employed whereby conservative treatment options are used to the point that no additional benefit can be expected. Accordingly, only nine kinesitherapeutic sessions for the management of low back pain are reimbursed.

Among the interventional treatment modalities, TENS and radiofrequency are used three times more often in the Netherlands. In the Netherlands, TENS is reimbursed, which is not the case in Belgium. Further, radiofrequency treatment is not adequately reimbursed in Belgium. Epidural steroid administration is more frequently used in Belgium than in the Netherlands. In the Netherlands, most epidural steroid administrations are performed using the transforaminal approach under fluoroscopic guidance (nerve root infiltration).

The biggest difference between the Netherlands and Belgium was seen in the frequency of surgical intervention. In every 1000 inhabitants in the Netherlands, the number of surgical interventions without arthrodesis was 19% of that seen in Belgium. Surgical interventions with arthrodesis in the Netherlands were 37% of those performed in Belgium. Consequently, the use of neuro-modulation techniques, which are mainly indicated for the management of low back pain attributable to FBSS, are more frequent in Belgium and are responsible for an additional €21.9 million per year.

The costs for the therapeutic options that could be calculated was €72.5 million for Belgium, which is theoretically €36.2 million more expensive than in the Netherlands.

**CONCLUSIONS**

Chronic low back pain is a complex, multidimensional problem requiring multidisciplinary evaluation and management. The newer interventional treatment modalities offer new perspectives for patients suffering pain refractory to conventional treatment. Frequently proposed treatment algorithms point toward a progressive and integrated use of the least invasive interventions before moving on to more invasive techniques. The cost analysis clearly indicates that percutaneous, minimally invasive techniques are less expensive, and their appropriate use may prevent the need for more invasive and more expensive techniques.

**REFERENCES**


<table>
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<tr>
<th></th>
<th>Total Number Be</th>
<th>Total Number NL</th>
<th>N per 1000 Inhabitants</th>
<th>N per 1000 Inhabitants NL</th>
<th>Ratio Be/NL</th>
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</thead>
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<tr>
<td>Medication</td>
<td>1,883,000</td>
<td>1,784,527</td>
<td>188.30</td>
<td>118.97</td>
<td>1.6/1</td>
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<tr>
<td>TENS</td>
<td>1,100</td>
<td>5,000</td>
<td>0.11</td>
<td>0.33</td>
<td>1/3</td>
</tr>
<tr>
<td>Epidural steroids</td>
<td>35,000</td>
<td>17,640</td>
<td>3.50</td>
<td>1.16</td>
<td>3.3/1</td>
</tr>
<tr>
<td>Radiofrequency</td>
<td>1,428</td>
<td>6,011</td>
<td>0.14</td>
<td>0.40</td>
<td>1/2.8</td>
</tr>
<tr>
<td>Epidural neurostimulation</td>
<td>233</td>
<td>89</td>
<td>0.02</td>
<td>0.001</td>
<td>4/1</td>
</tr>
<tr>
<td>Intrathecal drug administration</td>
<td>82</td>
<td>32</td>
<td>0.008</td>
<td>0.002</td>
<td>4/1</td>
</tr>
<tr>
<td>Surgery without arthrodesis</td>
<td>12,899</td>
<td>3,528</td>
<td>1.29</td>
<td>0.24</td>
<td>5.5/1</td>
</tr>
<tr>
<td>Surgery with arthrodesis</td>
<td>3,198</td>
<td>1,851</td>
<td>0.32</td>
<td>0.12</td>
<td>2.6/1</td>
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</table>

TENS, transcutaneous electrical nerve stimulation.


