

IMPACT OF AGE ON THE COST-EFFECTIVENESS OF FACET AND SACRAL EPIDURAL BLOCKS

IMPACTO DA IDADE SOBRE A CUSTO-EFETIVIDADE DOS BLOQUEIOS EPIDURAIS FACETÁRIOS E SACRAIS

IMPACTO DE LA EDAD EN LA COSTO-EFECTIVIDAD DE LOS BLOQUEOS EPIDURALES FACETARIOS Y SACROS

MARILIA DE JESUS NOGUEIRA¹ , ANDERSON GOMES MARIN² , MARIANA DEMÉTRIO DE SOUSA PONTES² , CHRISTIANO CRUZ DE ANDRADE LIMA³ ,
CARLOS FERNANDO PEREIRA DA SILVA HERRERO⁴ 

1. Grupo São Lucas, Ribeirão Preto, SP, Brazil.

2. Faculdade de Medicina de Ribeirão Preto (USP), Ribeirão Preto, SP, Brazil.

3. Hospital da Baleia, Belo Horizonte, MG, Brazil.

4. Faculdade de Medicina de Ribeirão Preto (USP), Department of Orthopaedia and Anesthesiology, Ribeirão Preto, SP, Brazil.

ABSTRACT

Objective: To evaluate the cost-effectiveness of combining sacral epidural block with foraminal block in the treatment of degenerative lumbar spine diseases and compare it with patient age. **Materials and Methods:** This is a retrospective cohort study. A total of 47 patients with degenerative lumbar spine disease associated with radiating leg pain were included. Low back pain and leg pain were assessed using the visual analog scale (VAS), applied during the consultation before the procedure and one week after. Data were compared pre- and postoperatively using the paired Student's t-test. Cost-effectiveness and the cost required for a one-point improvement in VAS to age were calculated using the sum, division, and the rule of three. For inferential analysis, the paired Welch's t-test with Bootstrap and the robust median test were used. **Results:** For low back pain, scores ranged from 2 to 10, with a mean of 7.5 ± 2.14 (95% CI: 6.8- 8.1) before the procedure, and from 0 to 10, with a mean of 3.1 ± 2.8 (95% CI: 2.3-4.0) one week after ($p < 0.0001$). For leg pain, scores ranged from 1 to 10, with a mean of 6.8 ± 2.5 (95% CI: 6.1-7.4) before the intervention, and from 0 to 9, with a mean of 2.4 ± 2.5 (95% CI: 1.8- 3.1) one week after ($p < 0.0001$). The cost of materials used for each procedure was 214.72 reais. Patients over 60 years old showed better cost-effectiveness compared to younger patients in lumbar infiltrations, with Welch's t-test with Bootstrap 56.0 [21.5;90.2] ($p = 0.006$). Regarding leg pain, there was no significant difference, with Welch's t-test with Bootstrap -32.4 [-70.9;7.00] ($p = 0.12$). **Conclusion:** The combination of sacral epidural block and foraminal block in patients over 60 years old for lumbar pain demonstrated better cost-effectiveness, while for leg pain, there was no significant difference in the cost-effectiveness of the procedure. **Level of Evidence III; Retrospective Cohort Study.**

Keywords: Nerve Block; Chronic Diseases; Low Back Pain; Pain; Age Groups.

RESUMO

Objetivo: Avaliar custo efetividade da combinação do bloqueio epidural sacral com o bloqueio foraminal no tratamento de doenças degenerativas da coluna lombar e comparar com a idade dos pacientes. **Materiais e Métodos:** Trata-se de um estudo do tipo coorte retrospectiva. Foram incluídos 47 pacientes com doença degenerativa da coluna lombar associada a dor irradiada para perna. A avaliação da dor lombar e da dor nas pernas foi quantificada por meio da escala visual analógica (EVA), aplicada na consulta antes do procedimento e uma semana após. Os dados foram comparados no pré e no pós-operatório por meio do teste t student para amostras pareadas. A custo efetividade e o valor necessário para melhora de um ponto na EVA em relação a idade foram calculados por meio de cálculos de soma, divisão e regra de três. Para análise inferencial, utilizou-se o teste T de Welch pareado com Bootstrap e o teste robusto de medianas. **Resultados:** Na dor lombar, observou-se a variação de 2 a 10, com média de $7,5 \pm 2,14$ (IC95%: 6,8-8,1) antes do procedimento e a variação de 0 a 10, com média de $3,1 \pm 2,8$ (IC95%: 2,3-4,0) uma semana após ($p < 0,0001$). Na dor nas pernas, observou-se a variação de 1 a 10, com média de $6,8 \pm 2,5$ (IC95%: 6,1-7,4) antes da intervenção e uma variação de 0 a 9, com média de $2,4 \pm 2,5$ (IC95%: 1,8-3,1) uma semana após ($p < 0,0001$). O custo dos materiais utilizados durante cada procedimento foi de 214,72 reais. Pacientes acima de 60 anos apresentaram melhor custo efetividade em relação a pacientes mais jovens em infiltrações lombares, com teste T de Welch com Bootstrap 56,0 [21,5;90,2] ($p = 0,006$). Em relação a dor nas pernas não houve diferença significativa, com teste T de Welch com Bootstrap -32,4 [-70,9;7,00] ($p = 0,12$). **Conclusão:** A combinação dos procedimentos bloqueio epidural sacral e bloqueio foraminal em pacientes acima de 60 anos em relação a dor lombar mostrou-se apresentar melhor custo efetividade, enquanto que em relação a dor nas pernas não houve diferença significativa no custo efetividade do procedimento. **Nível de Evidência III; Estudo de Coorte Retrospectivo.**

Descritores: Bloqueio Nervoso; Doenças Degenerativas; Dor Lombar; Dor; Grupos Etários.

Study conducted by the Faculdade de Medicina de Ribeirão Preto (USP), USP Campus, University City, Ribeirão Preto, SP, Brazil. 14040-900.

Correspondence: Marília de Jesus Nogueira. 60, Rua Sergio Paulo Freddi, Morumbi, SP, Brazil. marilijesusnogueira@gmail.com



RESUMEN

Objetivo: Evaluar la costo-efectividad de la combinación de bloqueo epidural sacral con bloqueo foraminal en el tratamiento de enfermedades degenerativas de la columna lumbar y compararlo con la edad de los pacientes. **Materiales y Métodos:** Se trata de un estudio de cohorte retrospectiva. Se incluyeron 47 pacientes con enfermedad degenerativa de la columna lumbar asociada a dolor irradiado a la pierna. La evaluación del dolor lumbar y del dolor en las piernas se cuantificó mediante la escala visual analógica (EVA), aplicada en la consulta antes del procedimiento y una semana después. Los datos se compararon en el pre y postoperatorio mediante la prueba t de Student para muestras emparejadas. La costo-efectividad y el valor necesario para mejorar un punto en la EVA en relación con la edad se calcularon mediante cálculos de suma, división y regla de tres. Para el análisis inferencial, se utilizó la prueba t de Welch emparejada con Bootstrap y la prueba robusta de medianas. **Resultados:** En el dolor lumbar, se observó una variación de 2 a 10, con una media de $7,5 \pm 2,14$ (IC95%: 6,8-8,1) antes del procedimiento y una variación de 0 a 10, con una media de $3,1 \pm 2,8$ (IC95%: 2,3-4,0) una semana después ($p < 0,0001$). En el dolor en las piernas, se observó una variación de 1 a 10, con una media de $6,8 \pm 2,5$ (IC95%: 6,1-7,4) antes de la intervención y una variación de 0 a 9, con una media de $2,4 \pm 2,5$ (IC95%: 1,8-3,1) una semana después ($p < 0,0001$). El costo de los materiales utilizados durante cada procedimiento fue de 214,72 reales. Los pacientes mayores de 60 años presentaron una mejor costo-efectividad en comparación con los pacientes más jóvenes en infiltraciones lumbares, con la prueba T de Welch con Bootstrap 56,0 [21,5;90,2] ($p = 0,006$). En relación al dolor en las piernas, no hubo diferencia significativa, con la prueba T de Welch con Bootstrap -32,4 [-70,9;7,00] ($p = 0,12$). **Conclusión:** La combinación de los procedimientos de bloqueo epidural sacral y bloqueo foraminal en pacientes mayores de 60 años para el dolor lumbar mostró una mejor costo-efectividad, mientras que, en relación al dolor en las piernas, no hubo diferencia significativa en la costo-efectividad del procedimiento. **Nivel de Evidencia III; Estudio de Cohorte Retrospectiva.**

Descriptores: Bloqueo Nervioso; Enfermedades Crónicas; Dolor de la Región Lumbar; Dolor; Grupos de Edad.

INTRODUCTION

Lower back pain is one of the leading causes of disability worldwide, affecting individuals of all ages, but with the highest prevalence between 35 and 55 years of age.¹ The etiology is most often multifactorial, involving degenerative changes associated with aging, as well as fractures, tumors, and infections.¹ Genetic, biomechanical and environmental factors also play significant roles in the development of chronic back pain.^{1,2}

The symptoms of degenerative spine diseases can occur in up to 65% of the world population annually and up to 84% of people at some point in life,^{3,4} the most common being lumbar pain and radiating pain to the legs.⁴ It is estimated that 5 to 10% of individuals who experience lumbar pain will develop chronic pain. When correlated with age, the prevalence of lumbar pain and radiated pain to the lower limbs is 3 to 4 times higher in individuals over 50 years of age compared to those between the ages of 18 and 30 years.^{3,4} In addition, women, people with lower income, lower education, and smokers presented a higher prevalence of chronic lumbar pain and radiated pain.^{5,6}

Several authors have demonstrated an association between the symptoms resulting from these changes and the reduction in the patient's quality of life.^{7,8} Such symptomatology is responsible for frequent departures to early care, medical leave, and individual suffering, thereby generating high treatment costs.⁹ Thus, the treatment aims at improving the patient's clinical conditions and, consequently, improving their quality of life.^{9,10}

Treatments for lumbar pain involve both surgical and non-surgical measures, some of which include physical therapies and rehabilitation, pharmacotherapy, and behavioral therapies.¹¹ The surgical options include analgesic blocks, microdiscectomies, lumbar fusion (arthrodesis), arthroplasties, decompressions, among others.^{12,13} The decision on surgical or conservative treatment will depend on the symptoms and their severity; surgery is indicated in severe cases, such as loss of strength, instability, or nerve compressions that do not respond well to conservative treatment.¹⁴⁻¹⁶

Facet blocks and epidural blocks are gaining prominence in the treatment of symptoms arising from degenerative diseases of the spine.^{17,18} The injection of medications directly into the spine with the help of an image enhancer is a minimally invasive procedure aimed at confirming the presumptive diagnosis as well as improving pain.¹⁹ For this purpose, various materials are currently available, ranging from spinal anesthesia needles to radiofrequency cannulas and specific cannulas designed for performing spinal blocks.^{20,21}

Given this, the present study aimed to identify the relationship between the cost-effectiveness of facet and sacral epidural blocks and patient age in the treatment of symptoms caused by degenerative diseases of the lumbar spine.

MATERIALS AND METHODS

Ethical aspects

The study was approved by the Research Ethics Committee of the institution where it was conducted (CAAE: 48835721.8.0000.8098), by the principles outlined in Resolution No. 466/2012 of the National Health Council regarding the parameters of research involving humans. This is an observational study, specifically a retrospective cohort, employing both quantitative and qualitative analysis approaches. Because it was a secondary study in which patients were not directly investigated, a waiver of the need for formalized processing, as outlined in the Terms of Free and Informed Consent, was requested and granted.

Sample characteristics

In this study, 47 clinical studies were evaluated in which patients presented with lumbar pain associated with radiating pain to the lower limbs and were refractory to non-surgical treatment for more than four weeks. All patients included in this study were treated at the same clinic specializing in the treatment of spine diseases, and all procedures were performed at the same hospital by the same professional, who has more than 10 years of experience in spine surgery.

We considered as the inclusion criterion individuals of both genders, aged over 18 years, with lumbar pain and radiated pain to the refractory leg, who had undergone conservative treatment with analgesic medication and physiotherapy for more than four weeks, and who were treated through a combination of sacral epidural and foraminal blocks. The exclusion criteria included patients under 18 years of age, a diagnosis of tumor disease, infection, trauma to the spine, and a history of previous lumbar surgery. For confirmation of the diagnosis, complementary imaging methods, including radiography and magnetic resonance imaging, were used in all cases.

Evaluated variables

Among the information obtained from the medical records, we can cite the age of patients, gender, the total cost of materials used during the procedure, and the intensity of pain as measured by the visual analog scale before and after a week of infiltrations. All this information was obtained from the records present in the clinic and the hospital where the studied procedures were performed.

The total cost of the procedure was calculated by summing the costs of all devices, materials, and medicines used. All this information was obtained from the hospital's records, where the locks were carried out.

The cost-effectiveness (CuE) was calculated by dividing the

cost of the procedure by the average difference between the initial visual analog scale (VASi) and the final visual analog scale (VASf). The formula is presented below.

To facilitate interpretation, another measure of cost-effectiveness was calculated using the following rule of three to determine the cost necessary for a 1-point improvement in VAS (X).

In cases where the difference between VASi and VASf was less than or equal to 0, the value of X was arbitrarily adjusted for the total cost of the procedure.

PROCEDURES

Patients selected for infiltration were advised to go to the hospital for admission on the same day of the procedure. After the hospitalization, the assistant doctor met with the patient in the waiting room and showed them the Visual Analog Scale (VAS), asking the patient to identify and verbalize both the pain in the lumbar spine and the pain in the leg (VASi).

The patient was then directed to the surgical room and positioned in the ventral decubitus and received anesthetic sedation for better comfort during the procedure. Correct asepsis and antisepsis of the lumbar spine and sacral hiatus, parameterization of the surgeon, and placement of sterile fields were performed. The surgeon prepared the two solutions that would be injected into the patients, being foraminal block the combination of a 2% lidocaine ampoule 20mg/ml without vasoconstrictor (xylestesin®) 1 a Triamcinolone ampoule hexacetonine 20mg/ml (Triancil®), and to sacral peridural block a solution containing a 5mg ampoule of betamethasone dipropionate + 2 mg Disodium phosphate (Eurofarma®) and a 2% lidocaine ampoule 20 mg/ml without vasoconstrictor (xylestesin®).

The image amplifier (Model: GE OCE Fluorostar Compact®; Manufacturer: GE OCE MEDICAL SYSTEMS GMBH; Series Number: FCDxxA18120685; Date of manufacture: December 2018; Germany) was first positioned in the anteroposterior incidence for correct identification of the desired lumbar level and with the oblique incidence the needle with the medication was inserted into the target foramen, this step was repeated according to the number of foramina affected and causing symptoms. Then, the image enhancer was positioned to obtain lateral incidence at the height of the sacrococcygeal. After correct confirmation of the image and palpation of the sacral hiatus, the needle was inserted, and radiopaque contrast 300 mg/ml was injected (Omnipaque® 50 ml), and subsequently, the sacral analgesic solution prepared previously was injected.

Subsequently, the patient was referred to the post-anesthesia recovery room, and discharge occurred on the same day, according to the criteria established by the anesthetic medical team.

A week after the procedure, the patient was directed to return to the clinic for reevaluation, and again, the Visual Analog Scale was administered, and he was classified with the same level of back pain and leg pain (VASf).

All the procedures studied were performed in the same hospital, by the same spine surgeon, using the same image amplifier. All patients were subjected to the combination of foraminal and sacral blocks, with the same solution. The number of infiltrated foramina was not taken into consideration, since there was no change in the amount of medication used, and any excess material was discarded.

Statistical analysis

The data were tabulated using Microsoft Excel 2016 software. The data obtained were analyzed statistically using the Stata software, using averages, standard deviations, and a 95% confidence interval.

For inferential analysis, the Welch t-test, paired with Bootstrap and the robust median test, was used to determine whether there is a difference in the cost and effectiveness of treatment among patients over 60 years of age. P values lower than 0.05 were considered statistically significant.

RESULTS

Forty-seven patients with degenerative diseases of the spine associated with lumbar pain and/or radiated pain in the leg were selected for the study. In total, there were 17 men and 30 women, with ages ranging from 24 to 86 years, with an average of 56.4 ± 17.23 years. The age of female patients ranged from 26 to 84 years, with an average of 60.13 years; and the age of male patients ranged from 24 to 86 years, with an average of 49.17 years. Among the diagnoses of the patients evaluated, we had: facet degeneration, degeneration of the intervertebral disc, vertebral canal stenosis, disc hernia, and patients with grade 1 vertebral listhesis. Regarding the complications, no occurrences were identified.

Concerning lumbar pain, values were identified that ranged from 2 to 10, with an average of 7.5 ± 2.14 (95% CI 6.8 – 8.1) before the procedure (VASi) and the average of 0 to 10, with an average of 3.1 ± 2.8 (95% CI 2.3 – 4.0) a week after ($p < 0.0001$) the procedure (VASf). (Table 1)

About pain in the lower limbs, values were identified that ranged from 1 to 10, with an average of 6.8 ± 2.5 (95% CI 6.1 – 7.4) before the procedure (VASi) and one varied from 0 to 9, with an average of 2.4 ± 2.5 (95% CI 1.8 – 3.1) a week after ($p < 0.0001$) the procedure (VASf). (Table 1)

The total value of the procedure was R\$ 214.75 and was the same for all patients included in the study. (Table 2)

Patients over 60 years of age showed better cost effectiveness (lower value required for 1 VAS improvement) compared to younger patients when receiving infiltrations for lumbar pain. (Table 3)

However, with regard to pain in the legs, there was no significant difference between the cost and effectiveness of the procedure among patients over 60 years of age compared to younger patients when receiving infiltrations for pain in the legs. (Table 4)

Table 1. Assessment of pain in the lumbar spine (n=45) and lower limbs (n=56) by visual analog scale (VAS) in patients undergoing epidural block.

Pain	Preoperative	Postoperative	p
Low Back	7.5 ± 2.14	3.1 ± 2.8	< 0.0001
	(95% CI 6.8 – 8.1)	(95% CI 2.3 – 4.0)	
Lower members	6.8 ± 2.5	2.4 ± 2.5	< 0.0001
	(95% CI 6.1 – 7.4)	(95% CI 1.8 – 3.1)	

Table 2. Materials used to perform sacral epidural and foraminal blocks, with their respective quantities and costs in real (Adapted Authors).

Material used	Quantity	Unit value (R\$)	Total value (R\$)
Alfentanil 0.5 mg/ml	1 ampoule	14.99	14.99
Midazolam 1mg/ml	1 ampoule	5.27	5.27
Ringer lactate 500 ml	1 bag	2.14	2.14
Abocath 24G (0.7x119 mm)	1 unit	2.53	2.53
Nasal oxygen catheter	1 unit	0.91	0.91
Microdrip infusion set	1 unit	3.82	3.82
Tegaderm peripheral catheter	1 unit	5.45	5.45
Needle 25mm x 8mm	1 unit	0.1	0.1
Spinal needle	3 units	13.56	40.68
10 ml syringe with thread	2 units	0.5	1
5 ml syringe with thread	1 unit	0.33	0.33
5 ml syringe without thread	1 unit	0.33	0.33
Betamethasone dipropionate + disodium phosphate 5 mg +2 mg	1 unit	3.25	3.25
Non-ionic iodized contrast 300 mg/ml	1 unit	34.68	34.68
Lidocaine 2%	1 unit	6.11	6.11
Triamcinolone 20mg/ml	1 unit	81.2	81.2
Sterile operating field	1 unit	7.06	7.06
Chlorhexidine 0.5% alcoholic solution 100 ml	1 unit	1.87	1.87
Sterile Gaze	2 units	0.7	1.4
Surgical glove	1 unit	1.63	1.63
	-	-	214.75

Legends: mg=milligrams, ml=milliliters, mm=millimeters, %=percentage, R\$= real.

Table 3. Comparison of the cost for one lumbar VAS improvement between age groups.

Variable	Statistics	Age group		Test Effect [95% CI]
		59-	60 +	
Cost for the improvement of 1 VAS				Welch T-Test with Bootstrap
	Min/Max	18.0/179.7	18.0/179.7	56.0 [21.5;90.2]. p= 0.006
				Robust Median Difference Test
				44.9 [0; 154.02]. p=0.043
	Med [IQI]	74.9 [31.4;179.7]	29.9 [25.7;44.9]	
	Average (SD)	101.5 (74.6)	45.3 (42.3)	
	N (NA)	22 (0)	25 (0)	

Legend: Med: Median; IQI: Interquartile interval; SD: Standard deviation; NA: Missing or Not Applicable; N = Number; CI: Confidence interval.

Table 4. Comparison of the cost to improve 1 VAS leg between age groups.

Variable	Statistics	Age group		Test Effect [95% CI]
		59-	60 +	
Cost by improvement of 1 VAS				Welch T-Test with Bootstrap
	Min/Max	18.0/179.7	20.0/179.7	-32.4 [-70.9;7.00]. p=0.12
				Robust Median Difference Test
				-119 [-149.4;0]. p=0.29
	Med [IQI]	59.9 [25.7;179.7]	179.7 [44.9;179.7]	
	Average (SD)	96.9 (75.0)	129.7 (68.7)	
	N (NA)	21 (0)	33 (0)	

Legend: Med: Median; IQI: Interquartile interval; SD: Standard deviation; NA: Missing or Not Applicable; N = Number; CI: Confidence interval.

DISCUSSION

When comparing the cost-effectiveness of the combination of foraminal and sacral blocks across different patient age groups, this study demonstrated that, regarding lumbar spine pain, patients over 60 years old exhibited better cost-effectiveness compared to younger patients. However, no statistically significant difference was found concerning pain in the lower limbs. Additionally, the low cost of performing the procedure was also highlighted.

The use of corticosteroid blocks for the management of lumbar and sciatic pain has been studied and performed since 1953, when Lievre reported the first peridural injection of hydrocortisone.¹¹

Corticosteroids have analgesic and anti-inflammatory properties by inhibiting the release of arachidonic acid from the membranes of injured cells, producing various beneficial effects such as reduction of edema, less fibrin deposition, vasoconstriction, and decreased leukocyte migration to the inflamed area, thereby reducing disease activity and pain mechanisms.¹¹ However, although they are effective for controlling lumbar and lower limb pain, especially in acute pain cases, there is no statistically significant long-term difference between patients who received infiltration and control patients.¹¹ The therapeutic effects mainly occur in the short- and medium-term, but the procedure is valid and important since it has been shown to effectively control pain, reduce movement limitation, and improve patients' work capacity. These findings reported in the literature were also observed in this study, as the patients evaluated showed pain improvement within a short period (1 week).

Although many studies show that epidural infiltrations do not change the evolutionary process of the disease, they can provide immediate relief from the patient's pain, enabling early rehabilitation and an early return to labor and laser activities.^{11,20} Furthermore, these blocks are minimally invasive procedures, low-cost, and have low rates of complications, performed in a surgical center, with hospital discharge on the same day and immediate improvement in the patient's pain, when compared to conventional surgical procedures.^{18,20}

As limitations, one can highlight in this study the fact that this is a work based on observational analysis of the records, and no intervention or presence of control groups is carried out. In addition, there was no selection or separation of groups by age; only 47 medical records were selected and compared regarding cost and effectiveness by patient age, both for back pain and for pain in the lower limbs. As a parameter for pain improvement, only the Visual Analog Scale of pain was used, and no quality-of-life questionnaires were administered, which could have provided more information about the impact of pain improvement, early return to the rehabilitation process, and return to daily and work activities.

However, it is worth noting that this study was conducted within a well-defined protocol for treating lumbar pain and radiation-induced pain. In addition, all selected clinical records were from patients who underwent a combined procedure for foraminal and sacral epidural block, performed by the same spine surgeon at the same hospital, and treated at a specialized clinic for pain management and spine surgery. Another important point was the presentation of the value and effectiveness of the combination of foraminal and sacral blocks in relation to patients' ages; such data and comparisons were not available in the current literature.

CONCLUSION

Patients with lumbar pain over 60 years of age undergoing a combination of foraminal and sacral block presented better cost-effectiveness compared to younger patients in the study sample. Regarding the pain irradiated to the lower limbs, there was no significant difference in cost and effectiveness between patients over 60 years of age and those who were younger.

All authors declare no potential conflict of interest related to this article.

CONTRIBUTIONS OF THE AUTHORS: Each author contributed individually and significantly to the development of this article. NMJ: conceptualization, data curation, original draft writing; LCCA: formal analysis, research and validation; MA: project administration, supervision and visualization; PMD.: meteorology; HCFPS.: validation and writing- review and editing.

REFERENCES

- Alves AC, Gonçalves AL. Conservative versus surgical treatment in patients with lumbar disc herniation. *BrJP*. 2021;4(4):357-361. doi: 10.5935/2595-0118.20210067.
- Meucci RD, Fassa AG, Faria NM. Prevalence of chronic low back pain: systematic review. *Rev Saude Publica*. 2015;49:1. doi: 10.1590/S0034-8910.2015049005874.
- Walker BF. The Prevalence of Low Back Pain: A Systematic Review of the Literature from 1966 to 1998. *Journal of Spinal Disorders*. 2000;13(3):205-17.
- Stefane T, Santos AM, Marinovic A, Hortense P. Chronic low back pain: pain intensity, disability and quality of life. *Acta paul. enferm*. 2013;26(1). doi: 10.1590/S0103-21002013000100004.

5. Katz JN. Lumbar disc disorders and low-back pain: socioeconomic factors and consequences. *J Bone Joint Surg Am*. 2006;88 Suppl 2:21-4. doi: 10.2106/JBJS.E.01273.
6. Hoy D, Bain C, Williams G, March L, Brooks P, Blyth F, et al. A systematic review of the global prevalence of low back pain. *Arthritis Rheum*. 2012 Jun;64(6):2028-37. doi: 10.1002/art.34347.
7. Silva NA, Martins MR. Pain, kinesiophobia and quality of life of low back pain patients. *Revista Dor*. 2014;15(2). doi: 10.5935/1806-0013.20140023.
8. Nascimento PR, Costa LO. Low back pain prevalence in Brazil: a systematic review. *Cadernos de Saúde Pública*. 2015;31(6):1141-56. doi:10.1590/0102-331x00046114.
9. Volinn E, Van Koeveering D, Loeser JD. Back sprain in industry. The role of socioeconomic factors in chronicity. *Spine (Phila Pa 1976)*. 1991;16(5):542-8. doi: 10.1097/00007632-199105000-00010.
10. Malanga GA, Nadler SF. Nonoperative treatment of low back pain. *Mayo Clin Proc*. 1999;74(11):1135-48. doi: 10.4065/74.11.1135.
11. Pucci GC, Rech CR, Fermino RC, Reis RS. Association between physical activity and quality of life in adults. *Rev Saude Publica*. 2012;46(1):166-79. English, Portuguese. doi: 10.1590/s0034-89102012000100021.
12. Almeida DC, Kraychete DC. Low back pain – a diagnostic approach. *Revista Dor*. 2017;18(2). doi:105935/1806-0013.20170034.
13. Tonkovich-Quaranta LA, Winkler SR. Use of epidural corticosteroids in low back pain. *Ann Pharmacother*. 2000;34(10):1165-72. doi: 10.1345/aph.18290.
14. Sousa FA, Colhado OC. Lumbar Epidural Anesthesia in the Treatment of Discal Lombosciatalgia: A Comparative Clinical Study between Methylprednisolone and Methylprednisolone with Levobupivacaine. *Rev Bras Anesthesiol*. 2011;61(5):549-55. doi:10.1590/s0034-70942011000500004.
15. Elliott TE, Renier CM, Palcher JA. Chronic pain, depression, and quality of life: correlations and predictive value of the SF-36. *Pain Med*. 2003;4(4):331-9. doi: 10.1111/j.1526-4637.2003.03040.x.
16. Ibrahim T, Tleyjeh IM, Gabbar O. Surgical versus non-surgical treatment of chronic low back pain: a meta-analysis of randomised trials. *Int Orthop*. 2008;32(1):107-13. doi: 10.1007/s00264-006-0269-6.
17. Ekman M, Jönhagen S, Hunsche E, Jönsson L. Burden of illness of chronic low back pain in Sweden: a cross-sectional, retrospective study in primary care setting. *Spine (Phila Pa 1976)*. 2005;30(15):1777-85. doi: 10.1097/01.brs.0000171911.99348.90.
18. Mutubuki EN, Van Helvoirt H, Van Dongen JM, Van 't Klooster M, Jornada Ben Â, Vleggeert-Lankamp C, et al. Effectiveness and cost-effectiveness of mechanical diagnosis and treatment combined with transforaminal epidural steroid injections for patients on a waiting list for surgery for a chronic lumbar herniated disc: a randomized controlled trial and economic evaluation. *Spine J*. 2025;S1529-9430(25)00058-0. doi: 10.1016/j.spinee.2025.01.012.
19. He Y, Chen L, Xu Z, Wang J, Liu B. [Lumbar transforaminal epidural block for treatment of low back pain with radicular pain]. *Nan Fang Yi Ke Da Xue Xue Bao*. 2020;40(12):1804-1809. Chinese. doi: 10.12122/j.issn.1673-4254.2020.12.16.
20. Dernek B, Aydoğmuş S, Ulusoy İ, Duymuş TM, Ersoy S, Kesiktaş FN, et al. Caudal epidural steroid injection for chronic low back pain: A prospective analysis of 107 patients. *J Back Musculoskelet Rehabil*. 2022;35(1):135-139. doi: 10.3233/BMR-200262.
21. Foster NE, Anema JR, Cherkin D, Chou R, Cohen SP, Gross DP, et al. Prevention and treatment of low back pain: evidence, challenges, and promising directions. *Lancet*. 2018;391(10137):2368-2383. doi: 10.1016/S0140-6736(18)30489-6.
22. Pennington Z, Swanson MA, Lubelski D, Mehta V, Alvin MD, Fuhrman H, et al. Comparing the short-term cost-effectiveness of epidural steroid injections and medical management alone for discogenic lumbar radiculopathy. *Clin Neurol Neurosurg*. 2020;191:105675. doi: 10.1016/j.clineuro.2020.105675.
23. Manchikanti L, Cash KA, Pampati V, Falco FJ. Transforaminal epidural injections in chronic lumbar disc herniation: a randomized, double-blind, active-control trial. *Pain Physician*. 2014;17(4):E489-501.