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# Decrease in opioid use and spinal interventions after basivertebral nerve ablation

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ARTICLE INFO	ABSTRACT
Keywords: Basivertebral nerve ablation Opioids Low back pain Vertebrogenic pain Lumbar spine surgery	<i>Background:</i> Basivertebral nerve radiofrequency ablations (BVNRFA) have shown efficacy in improving chronic back pain for indicated patients. <i>Objective:</i> The purpose of this study was to evaluate health care utilization outcomes after BVNRFA in a large cohort utilizing a global database. <i>Methods:</i> TriNetX, a global health research network, was queried from 2022 to 2025 for patients who underwent BVNRFA utilizing CPT codes and 1 year pre-procedure and post-procedure opioid use and spine interventions were recorded. Pre-procedure and post-procedure outcomes were compared using a chi-square test with significance set at $p < 0.05$ . The rate of spine surgery within 1 year after BVNRFA was also reported. <i>Results:</i> A total of 1,118 patients underwent BVNRFA during this time frame at contributing health care systems with appropriate follow-up. Post-procedure opioid use was less than pre-procedure opioid use (57 % vs 51 %, p = 0.006). The number of patients who received spine interventions after BVNRFA were significantly lower compared to patients who received spine interventions prior with lumbar transforaminal epidural steroid injections decreasing from 21 % to 12 % ( $p < 0.001$ ), lumbar interlaminar steroid injections decreasing from 18 % to 11 % ( $p < 0.001$ ), and radiofrequency ablations decreasing from 25 % to 13 % ( $p < 0.001$ ). Only 47 patients had CPT codes for posterior lumbar fusion (CPT 22630), 10 had lateral lumbar fusion (CPT 22533), and 10 had anterior codes (CPT 22558). There were 0 patients who underwent total disc replacement (CPT 22857). <i>Conclusions:</i> This administrative database study demonstrated significantly less opioid use and spine interventions within 1 year after BVNRFA compared to 1 year prior. This study also demonstrated low rates of spine surgery within 1 year after BVNRFA.

# 1. Introduction

Chronic low back pain (CLBP) is a leading cause of disability [1]. Previous work has shown that patients with CLBP have high rates of health care utilization [2]. Though largely noted to be ineffective [3], opioid prescriptions for CLBP have increased over the past several decades [4,5]. There are many potential pain generators of CLBP which can make accurate diagnosis difficult [6] and lead to potentially wasteful health care utilization before proper diagnostic measures and interventions are performed. Interventional spine procedures have been utilized to treat patients with CLBP in an effort to improve pain and function and delay or prevent surgery. Guidelines for interventional spine procedures vary in the literature [7] with recent publications recommending against spinal interventions [8]. Greater work is needed to assess the ability of targeted spinal interventions for specific etiologies of CLBP to not only improve patient outcomes but also decrease the overall health care utilization of patients with CLBP.

Basivertebral nerve radiofrequency ablation (BVNRFA) has been shown to be an effective treatment for patients with chronic midline low back pain and corroborating Modic changes on MRI who fail conservative treatments [9,10]. Improvements in disability and function have been shown to last multiple years [11]. Prior work evaluating outcomes from randomized controlled trials have demonstrated that BVNRFA is cost effective [12] and can decrease healthcare utilizations [13]. More work is needed to assess the health care utilization of patients in the real world application of BVNRFA for the general population.

The purpose of our study was to assess healthcare utilization after BVNRFA utilizing a large global database.

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### 2. Methods

TriNetX is a large global database with over 130 million deidentified patient data across 100+ United States healthcare systems contributing to the database. The database may be queried using International Classification of Disease codes, 10th Revision (ICD-10) and Current Procedural Terminology codes (CPT). TriNetX was queried to identify all adult patients (>18 years of age) undergoing BVNRFA (CPT 64628) in the United States from January 2022 to April 2025. There were no diagnostic or procedural codes (such as pre-procedure surgery) that were applied to exclude patients. Patients without any pre-procedure or any follow-up data after BVNRFA were excluded. The database is unable to exclude patients without follow-up data in the system exceeding a specific time frame. Given this, patients were only included in the analysis if they underwent BVNRFA over a year prior to database query (January 2022 to April 2024). The number of patients who underwent lumbar transforaminal epidural steroid injections (CTFESI; CPT 64483), interlaminar epidural steroid injections (IESI; CPT 62323), and medial branch radiofrequency ablation (MBRFA; CPT 64635) were obtained for 1 year prior and 1 year after BVNRFA. The number of patients who were prescribed opioids during the 1 year prior to 1 day before BVNRFA was also obtained. Post-procedure opioid use was obtained for the time period of 1-13 months after BVNRFA. This time frame was selected to eliminate patients who may have been prescribed a short course of postprocedure opioids as part of standard discharge order protocols. The number of patients with spinal column surgery codes within 1 year after BVNRFA was also recorded. Specific lumbar spine surgery of interest included patients undergoing fusion via the poster approach (CPT 22633), lateral (CPT 22533) or anterior (CPT 22558) and those undergoing total disc arthroplasty (CPT 22857).

# 2.1. Statistical analysis

The number of BVNRFA performed per month at contributing health care systems to TriNetX was obtained. Internal software within TriNetX calculates the rate of new BVNRFA cases per month over the last 3 years from data query to establish a trend. Based on this trend, the number of BVNRFA cases 10 months after data query (performed April 2025) was predicted by the software. Outcomes were calculated as number and percent of the total BVNRFA. The outcomes of interest prior to BVNRFA were compared with occurrences after BVNRFA utilizing chi-square analysis. A p < 0.05 was considered significant. One-year surgical rates were calculated as number and percent.

# 3. Results

A total of 1,788 patients underwent BVNRFA during this time frame. In the available 103 contributing health care systems, BVNRFA was performed in 27. Fig. 1 demonstrates the increasing rate at which BVNRFA has been performed over the past 3 years and predicts that approximately 100 patients will undergo BVNRFA in February of 2026 from contributing TriNetX health care systems.

Of the 1,788 patients, 1,660 patients had any follow-up data. The average age was 63.6 ( $\pm$ 14.1) and the cohort was 50.7 % male. Additional demographic data is reported in Table 1.

Table 1

Demographics of patients undergoing basivertebral nerve radiofrequency ablation.

Variable	Mean/N	Standard Deviation/%
Age	63.6	14.1
Sex		
Male	841	50.70 %
Female	791	47.70 %
Unknown	28	1.70 %
Race		
White	1431	86.20 %
Black	88	5.30 %
Asian	12	0.70 %
American Indian or Alaskan	10	0.60 %
Hawaiian or Pacific Islander	10	0.60 %
Other	56	3.40 %
Unknown	67	4.00 %
BMI <sup>a</sup>		
<20	15	1 %
20–29	185	11 %
30–39	194	12 %
40–49	47	3 %
50–59	12	1 %
60–69	10	1 %
70+	10	1 %

<sup>a</sup> BMI data was reported in 415 patients.



Fig. 1. Rate of Arrival of Patients undergoing Basivertebral Nerve Ablation. Vertical dotted line represents when results were obtained on TriNetX. X-axis (representing time) to the left of the dotted line illustrates the number of months prior to running the data. The y-axis illustrates that number of patients who underwent basivertebral nerve ablation per month. Data to the right of the vertical dotted line represents a predicted model for the number of patients per month.

Of the patients with follow-up data, there were 1,118 patients who underwent BVNRFA over a year prior to database query. Post-procedure opioid use was less than pre-procedure opioid use (57 % vs 51 %, p = 0.006). The number of patients who received spine interventions after BVNRFA were significantly lower compared to patients who received spine interventions prior to BVNRFA. Specifically, TFESI decreased from 21 % to 12 % (p < 0.001), lumbar IESI decreased from 18 % to 11 % (p < 0.001), and MBRFA decreased from 25 % to 13 % (p < 0.001). Only 47 (4 %) patients had CPT codes related to vertebral column spine surgery within 1 year. Specifically, there were 11 (0.98 %) patients who had CPT codes for posterior lumbar fusion (CPT 22630), 10 (0.89 %) had lateral lumbar fusion (CPT 22533), and 10 (0.89 %) had anterior codes (CPT 22558). There were 0 patients who underwent total disc replacement (CPT 22857).

#### 4. Discussion

This administrative database study identified 1,118 patients who underwent BVNRFA during the study time frame and found a decrease in health care utilization (decrease in opioid prescriptions and spine interventions) along with low rates of spine surgery following BVNRFA.

This is consistent with McCormick et al. who evaluated 247 patients from randomized controlled trials. In their study, they found that BVNRFA led to a decrease in therapeutic spine injections and opioid use [13]. Specifically, they found that opioid use declined from 31 % of patients using opioids before BVNRFA to 22.7 % after BVNRFA. The decrease in opioid use noted in our study was not as pronounced and more patients were needing opioid medications pre- and post-BVNRFA (57 %-51 %). The patients in McCormick et al.'s study may have been inherently less likely to have been prescribed opioid medications related to the exclusion criteria in the controlled trial. Their study excluded patients with radicular pain and prior lumbar spine surgery within 6 months. Additionally, two of the included trials in their analysis excluded patients taking extended release opioids. The use of a database was also limited in determining the reason for opioid use and we were unable to evaluate the dose and course of opioid use. It is possible that some patients were prescribed a short course of opioids within the 1 year post-BVNRFA time frame for a reason unrelated to back pain. In McCormick et al.'s study, the percentage of patients receiving lumbar spine injections decreased from 34 % 1 year before BVNRFA to 12 %after BVNRFA. This is similar to our study where only approximately 12 % of patients received steroid injections and 13 % had medial branch RFA within the year after BVNRFA. This current retrospective study of a large number of patients treated with BVNRFA outside of a controlled trial supports the findings of McCormick et al.'s study of patients included in hallmark randomized controlled trials in demonstrating a decrease in health care utilization and need of additional treatments for CLBP after BVNRFA.

BVNRFA has been shown to have lasting improvements in CLBP with recent literature demonstrating that 70 % of patients reported improvement at 5 years post-ablation and 30 % were still pain free [14]. Similar to our work, Khalil et al.'s study also demonstrated that BVNRFA led to a decrease in opioid use and spine injections [15]. Chronic opioid use has been shown to have limited benefit for treating CLBP with the potential for negative effects such as dependency, depression, drowsiness, and overdose [3]. This study additionally supports that BVNRFA can lead to a decrease in pain as evidenced by less spinal interventions and post-procedure opioid use. The decrease of opioid use presented in this work is likely an underestimation as we were unable to assess for patients who received opioids for differing reasons other than CLBP as mentioned above. Although our study was unable to directly assess patient reported pain levels, many other studies have demonstrated significant improvements in pain after BVNRFA [16–20].

Our study also demonstrates a low likelihood of patients to progress to eventual lumbar spine surgery after BVNRFA. This is similar to prior studies demonstrating that about 2–6 % of patients progressed to lumbosacral surgeries after BVNRFA [10,15]. Though spinal surgery is a valuable option for appropriately selected patients, complications can lead to debilitating outcomes with significant financial strain [21]. Spine surgery rates for CLBP have continued to increase over the past couple of decades [22,23]. Martin et al. demonstrated a 62 % increase in elective spine fusion for degenerative diagnoses [24]. Prior work evaluating surgical rates of patients with CLBP and degenerative disc disease noted that 17 % of patients underwent surgery within 6 months [25]. This work suggests that BVNRFA has the potential to decrease the need for surgical intervention.

# 4.1. Limitations

Our study has several limitations. Given that a database was utilized in this study, specific patient charts were unable to be assess for accuracy of codes or completeness of data. Given that opioid use was defined as having a medication prescription code, it is unknown the dose and frequency of which patients were taking their medications. Some patients may have only been prescribed a short course after an unrelated procedure or event vs other patients who may have required high doses of opioids chronically. It is also unknown if the patients who were using opioids after BVNRFA were the same patients who were using them before. We were also limited in our ability to assess for other injuries or pathology necessitating pain control. It is also unknown if the patients who underwent spine surgery did so for their CLBP and if the surgery was performed at similar levels as the BVNRFA. Appropriate patient selection and procedure technique were unable to be assessed. Strengths of our study include that a large cohort of 1118 patients were evaluated. Compared to the majority of studies evaluating outcomes after BVNRFA, this work assessed outcomes of patients not enrolled in a randomized controlled trial. Despite being unable to control for indications for BVNRFA and assess adequate procedural technique, this work is consistent with prior studies that do so and suggests that real-world outcomes from BVNRFA mimics those reported in the randomized controlled trials.

## 5. Conclusion

This administrative database study of 1,118 patients undergoing BVNRFA demonstrated a significant decrease in opioid use and spine interventions in the year after BVNRFA compared to the year prior and also demonstrated low 1 year spine fusion rates following BVNRFA.

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# Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### A.R. Stephens et al.

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