The Relationship Between Preoperative PROMIS Pain Interference and Pain Intensity Scores and Early Postoperative Pain and Opioid Consumption after Lumbar Fusion

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INTRODUCTION: Patients undergoing lumbar fusion often experience significant levels of postoperative pain requiring opioid analgesia. While it is well known that higher levels of preoperative pain and opioid utilization are risk factors for increased pain and opioid use during the early and extended recovery periods, the aspects of pain that influence these outcomes are poorly understood. The PROMIS Pain Interference and Pain Intensity measures quantify these separate dimensions of pain from the patient perspective. The Pain Interference measure evaluates the extent to which pain disrupts activities of daily living, family and social activities, and life enjoyment. In contrast, the Pain Intensity assesses pain severity at its worst, on average, and at the current time. Higher scores on both measures, indicating more severe burden of pain interference and intensity, are correlated with poorer physical function and mental health. Prior studies have shown that both lumbar decompression and fusion patients with high levels of pain interference preoperatively are more likely to experience clinically significant improvement in pain and disability at 6-weeks to 1-year postoperatively. However, the relationship between preoperative pain interference, intensity, and levels of pain and opioid consumption during the early postoperative period is unknown. The purpose of this study was to assess differences in these outcomes between patients with high and low levels of baseline pain intensity and interference, and to evaluate whether baseline PROMIS pain scores could be used as a leading indicator of increased pain and opioid consumption during early recovery after lumbar fusion.

METHODS: A retrospective review of 199 consecutive patients undergoing posterolateral fusion (PLF) with two fellowship trained spine surgeons at a single institution from January 1, 2021 to December 31, 2022 was performed. All patients underwent 1-3 level lumbar PLF with instrumentation and completed the PROMIS Pain Intensity and PROMIS Pain Interference measures preoperatively. Patients who did not complete PROMIS surveys, or who underwent 4+ level, cervical, or thoracic fusions were excluded. The primary endpoints were maximum pain levels reported using the numeric rating scale (NRS) and oral morphine milligram equivalents (OMME) received during postoperative days (POD) 0-5. Average pain scores and OMMEs received were compared between patients with the lowest ($\leq 25^{th}$ percentile) and highest ($\geq 75^{th}$ percentile) levels of PROMIS Pain Interference and Pain Intensity prior to surgery using independent samples t-tests. Multivariate linear regression was used to assess the relationship between preoperative PROMIS scores and postoperative pain NRS and OMME by day after controlling for age, sex, and body mass index (BMI). Statistical significance was assessed at $p<0.05$.

RESULTS: On average, patients were 66.2 ± 11.4 years old and had a BMI of 31.3 ± 5.8. Sixty-one percent of patients were female and 56% had an American Society of Anesthesiologists (ASA) ≥ 3. Forty-nine percent of patients underwent 1-level, 33% underwent 2-level, and 18% underwent 3-level PLF. The 25^{th} and 75^{th} percentile cutoffs of preoperative PROMIS Pain Intensity and Pain Interference scores were 52.1, 60.5, 62.1, and 73.5, respectively. In comparison to patients with the lowest preoperative pain intensity scores, those with the highest scores required significantly more OMMEs on PODs 0 and 1 (both $p<0.05$) and had higher pain NRS on POD1 ($p=0.02$). Patients with the highest pain interference scores reported higher pain NRS on POD0 ($p=0.02$), but required similar OMMEs at all timepoints. After controlling for age, sex, and BMI, each 1-point increase in preoperative PROMIS Pain Interference scores were associated with increased OMMEs on POD0 ($\beta=0.29$, $p=0.04$) and POD1 ($\beta=0.64$, $p=0.03$). No other statistically significant relationships between preoperative levels of pain interference or intensity and postoperative pain or opioid consumption were observed.

DISCUSSION AND CONCLUSION: In comparison to patients with the lowest levels of pain intensity preoperatively, those with high levels reported higher levels of pain and required more opioids during the first 24 hours postoperatively, while those with high pain interference reported higher levels of pain on the day of surgery, but utilized similar amounts of opioids. After risk adjustment, increased baseline PROMIS Pain Interference, but not Pain Intensity, scores were associated with increased opioid use on postoperative days 0 and 1, although not to clinically significant levels. These results suggest that both the intensity of pain and level of life disruption from pain should be considered when identifying patients at risk for increased pain and opioid consumption after PLF. While the PROMIS Pain instruments may prove useful for incorporation into multivariable models aimed at identifying patients at risk for significant postoperative pain and opioid consumption, they do not appear to achieve this goal when used in isolation.

Figure 1. Average Postoperative Pain NRS and OMME consumption: Low Pain Intensity (<52.1) vs. High Pain Intensity (>60.5) Patients

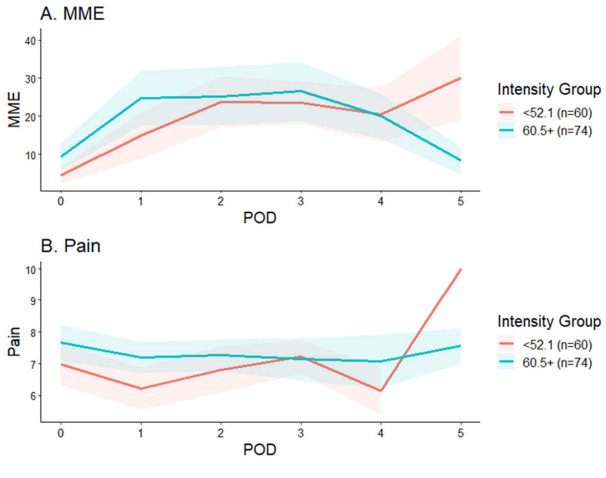

Figure 2. Average Postoperative Pain NRS and OMME consumption: Low Pain Interference (<62.1) vs. High Pain Interference (>73.5) Patients