Programmed to Undertreat? How AI Pain Models May Widen Disparities for Hispanic Surgical Patients: A Narrative Review

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INTRODUCTION

Hispanic Americans, the largest U.S. minority group, receive less regional anesthesia and opioid analgesia than non-Hispanic White patients, and 25 million U.S. residents have limited English proficiency (LEP). Artificial intelligence now guides opioid prediction, risk stratification, and ultrasound-guided blocks — inheriting biases embedded in its training data. This narrative review examines how algorithmic bias intersects with pain management in Hispanic surgical patients and what it means for regional anesthesia practice.

MATERIALS & METHODS

Narrative (non-systematic) review of PubMed, Embase, and Scopus through May 2026. Search terms combined artificial intelligence, machine learning, pain management, regional anesthesia, opioid prescribing, Hispanic, Latino, limited English proficiency, language discordance, health equity, and algorithmic bias. Eligible sources: clinical practice guidelines, systematic reviews, and original investigations addressing (1) AI in pain assessment or regional anesthesia, (2) racial/ethnic disparities in analgesic care, and (3) effects of language barriers on perioperative pain outcomes. Findings synthesized thematically; selection bias inherent to narrative methodology is acknowledged.

Table 1. Quantified Disparities in Analgesic & Regional Anesthesia Care Affecting Hispanic Surgical Patients

Domain	Comparison	Effect estimate (95% CI)	Setting	Evidence type	Year
Regional anesthesia receipt, overall	Hispanic vs non-Hispanic White	OR 0.80 (0.72–0.87)	Orthopedic, thoracic, obstetric	Meta-analysis	2025
Regional anesthesia receipt, thoracic surgery	Hispanic vs non-Hispanic White	OR 0.61 (0.46–0.80)	Thoracic surgery	Meta-analysis subgroup	2025
Postoperative opioid delivery (0–12 h)	Hispanic with LEP vs English-proficient non-Hispanic White	MR 0.29 (0.17–0.53) OME	Total joint arthroplasty	Cohort	—
Opioid analgesia receipt	Hispanic vs non-Hispanic White	~20% lower odds; unchanged 2011–2021	Acute/perioperative pain	Pooled/serial analyses	2011–2021
Anesthetic plan alteration, reduced regional use	Language-discordant vs concordant care	Consistent directional effect across 86 studies	Perioperative	Scoping review	2026
Pain expression modality	Spanish-speaking patients	Narrative descriptors preferred over 0–10 numeric scales	Perioperative & chronic pain	Qualitative synthesis	—
Opioid-risk prediction model validation	Published AI/ML models	~75% single-center only; high risk of bias	Prediction modeling	Systematic review	—

CI, confidence interval; LEP, limited English proficiency; MR, mean ratio; OME, oral morphine equivalents; OR, odds ratio.

BUILT ON BIASED DATA

AI Pain Tools Risk Encoding, Not Erasing, Hispanic Undertreatment

Across regional anesthesia access, pain communication, and opioid prediction, algorithms inherit the very disparities they could help close.

Figure 1. How historical inequities propagate through AI pain tools into compounded undertreatment

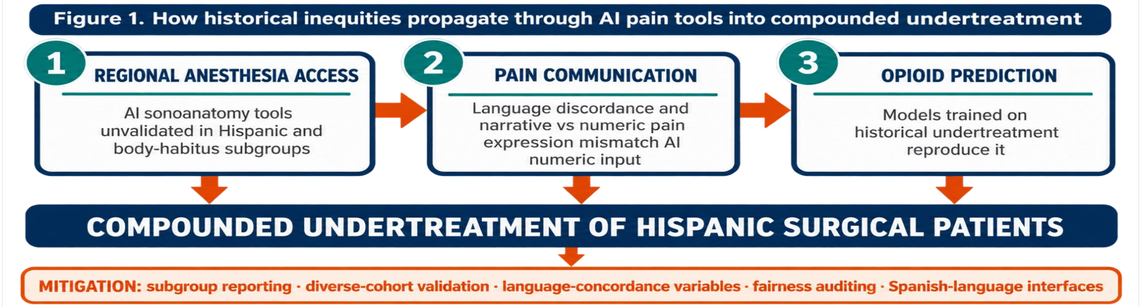


Table 2. AI Applications in Pain Medicine Mapped to Equity Risk & Mitigation

AI-assisted ultrasound sonoanatomy	Opioid requirement prediction	High-risk opioid misuse flagging	NLP-based pain documentation	Structured numeric pain assessment	Clinical decision support for perioperative analgesia
Current status: Regulatory-cleared; improves non-expert performance	**Current status:** Research/early clinical use	**Current status:** Embedded in some EHR workflows	**Current status:** Emerging	**Current status:** Widely deployed	**Current status:** Growing adoption
Equity gap identified: No published Hispanic subgroup performance data	**Equity gap identified:** Learned undertreatment reproduced as predicted need	**Equity gap identified:** Differential flagging not reported by ethnicity	**Equity gap identified:** Spanish-language and interpreted narratives underrepresented	**Equity gap identified:** Mismatch with narrative Spanish-language pain expression	**Equity gap identified:** No identified system accounts for language barriers
Proposed mitigation: External validation across ethnicity and BMI strata before deployment	**Proposed mitigation:** Fairness auditing with subgroup calibration and error-rate reporting	**Proposed mitigation:** Prospective disparate-impact monitoring; feature transparency	**Proposed mitigation:** Multilingual training; capture preferred language and interpreter use	**Proposed mitigation:** Culturally adapted, validated Spanish pain instruments	**Proposed mitigation:** Include preferred language, interpreter use, and SDOH as covariates

RESULTS

- **1. Regional anesthesia access**
  Hispanic patients were **less likely to receive regional anesthesia** across orthopedic, thoracic, and obstetric surgery, with the largest disparity in thoracic surgery (**OR 0.61**). AI-assisted sonoanatomy tools may improve block performance, but **Hispanic subgroup and body-habitus validation is lacking**.
- **2. Pain communication**
  Language discordance was associated with altered anesthetic plans, reduced regional anesthesia use, and inconsistent opioid dosing.
  Hispanic patients with limited English proficiency received substantially less postoperative opioid analgesia. Spanish-speaking patients also favored **narrative rather than numeric pain descriptions**, creating a potential mismatch with AI tools reliant on structured numeric inputs.
- **3. Opioid prediction**
  Hispanic patients experienced **persistently lower opioid analgesia receipt over the past decade**. Meanwhile, most opioid-prediction models were **single-center, high risk of bias, and rarely incorporated social determinants of health**, raising concern that AI could reproduce historical undertreatment.

DISCUSSION / CONCLUSION

Hispanic surgical patients face compounded disadvantages: reduced regional anesthesia access, pain communication lost in translation, and systematic opioid undertreatment. AI could narrow these gaps but risks encoding them.

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