❑ Abstract

Purpose:

There are significant incentives to reduce opioid consumption following lumbar spinal fusion. For the patient, opioid use is associated with several consequential side effects, including: sedation, respiratory depression, longer hospitalizations and physical dependence. For the healthcare system, the "opioid epidemic" represents a significant public health concern with an economic burden exceeding $55 billion.[1,2] Intravenous acetaminophen (IV-A) and intravenous ketorolac (IV-K) may help reduce post-operative opioid consumption. Unfortunately, the use of IV-A and IV-K in lumbar fusion surgery has been limited by perceived ineffectiveness and possible impact on fusion rates. A well-designed prospective trial is needed to determine the efficacy and safety of these multimodal analgesic approaches in spine surgery.

Hypothesis:

Compared to placebo, IV-K and IV-A will reduce post-operative opioid use, opioid-related complications and length of stay. Short-term, post-operative use of IV-K will have no impact on pseudarthrosis rates at 2 years.

Methods:

This protocol is an *IRB-approved* prospective, randomized, double-blind trial (ClinicalTrials.gov NCT02700451). Patients receive IV-A, IV-K or placebo for 48 hours after surgery. The inclusion and exclusion criteria are shown in **Table 1.** The treatment groups are detailed in **Table 2**. All patients receive IV patient-controlled analgesia (PCA) and oral pain medications. We plan to enroll 300 patients (100 in each arm) estimating an effect size of 30% with an alpha level of 0.05 and beta level of 0.08

Inclusion Criteria	Exclusion Criteria
• Age 18-75 • Require 1 or 2 level lumbar spinal fusion through posterior or lateral approach • No history of long term opioid use	• Anterior approach • Documented allergy to NSAIDs or Acetaminophen • History of: Peptic Ulcer Disease, Congestive heart failure, Elevated ALT/AST, Bleeding disorder, Renal dysfunction, Glucocorticoid use within 1 month of surgery • Current smokers (quite date < 30d ago)

Table 1. Inclusion and exclusion criteria

Group	**Intervention** (treatment started in OR about 1 hr prior to extubation)
Placebo	• Normal Saline IV q6h x 48h post-op as a standing dose
Ketorolac (IV-K)	• Ketorolac 30 mg IV q6h x 48h post-op as a standing dose
Acetaminophen (IV-A)	• Acetaminophen 1,000 mg IV q6h x 48h post-op as a standing dose

Table 2. Groups to which patients may be assigned

During the hospital stay, opioid use, complications and length of stay are recorded. Follow up is at 6 weeks, 3 months, 1 year and 2 years. Data collected at these time points include total opioid use, opioid related side effects, laboratory results and functional outcomes. At 2 year follow up, patients are assessed for pseudarthosis using radiographs, clinical signs/symptoms (pain, etc.) and a CT scan.