ABSTRACT
Ketamine is a non-NMDA antagonist of NMDA glutamate receptors. It is thought to play a role in pain transmission. Central sensitization and allodynia play a part in the neuropathic pain process. We chose to study this agent IV in the outpatient clinic to treat refractory pain flareups in an outpatient clinic setting in our search for additional agents to offer patients.

Thirty patients (21 female, 9 male) were treated for refractory pain flareups in the clinic with IV ketamine. A total of 75 infusions were administered. 18 patients had co-existent headache/migraine problems. Painful conditions treated were: cervical and lumbar radiculopathy (n=18), CRPS (n=7), trigeminal neuralgia (n=4) and TMD (n=3). An IV was placed and pulse oximetry was used in each patient. 0.3-0.4mg/kg was administered by IV infusion over 90 minutes. If there were no side effects, another 0.3-0.4mg/kg was administered over the same time. Patients rated severity of pain before and after treatment. An efficacy index was calculated by subtracting post-treatment pain severity from pre-treatment severity. A sense of exhilaration was reported by 4 patients and a sense of “spaciness” was reported by 9 patients. Only 1 patient fell asleep during treatment. Beginning pain severity was 6.5/10 and this reduced to 2.43/10 after treatment (p<.001, 2 tailed t test). Average ketamine infusion rate was 138 ml and the average dose of ketamine was 65.6mg. Side effects were transient “spaciness” in 9 patients and a sense of exhilaration in 4 more. No person fell asleep during treatment. In most cases, patients had a greater than #7/10 pain severity, and we stipulated that they do not drive to the clinic, but rather have somebody bring them.

We conclude that IV ketamine for treating refractory pain flareups is a very effective form of treatment in the outpatient clinic. It is quite efficacious, is tolerated well and has minimal transient side effects. The treatment should be closely monitored. Double-blind studies are clearly warranted for the unique agent.

OBJECTIVES
Our primary goal was to provide additional treatment options for our existing pain patients. We chose to study the efficacy and safety of IV ketamine in the outpatient pain and headache clinic. This is a medication that is rarely used because of perceived difficulties or side effects. We treated only patients who were well-known to the practice and typically had a occasional flareup of pain symptoms.

RATIONALE
As a mechanism of action of ketamine is a very specific mechanism of action (that of NMDA glutamate receptor blockade), we utilized this single-mode-of-action agent to study its efficacy in treating refractory pain flareups in an outpatient headache and pain center. We treated these clinical conditions in the setting of the clinic practice and the need for effective and safe agents to treat pain disorders is very basic or the practice.

METHODS
Our primary goal was to provide additional treatment options for our existing pain patients. Therefore, we did not treat patients that were not already in the practice and well-known to us. Patients had fees at home usual treatment for their pain flareup. None were allergic to anesthetics or ketamine by history. Painful conditions treated were: cervical and lumbar radiculopathy (n=18), CRPS (n=7), trigeminal neuralgia (n=4) and TMD (n=3).

An antecubital IV was placed and pulse oximetry was used in each patient. Patients rated their pain on a 0-10 VAS both before treatment and at 15 minute intervals during and after treatment. 0.3-0.4mg/kg was administered by IV infusion over 90 minutes. If there were no side effects, another 0.3-0.4mg/kg was administered over the same time. 25 patients received a 2nd IV infusion of ketamine. 8 patients received a 3rd IV infusion and 5 received a 4th infusion, using the same dosage. In most cases, patients had a greater than #7/10 pain severity, and we stipulated that they do not drive to the clinic, but rather have somebody bring them.

RESULTS
Beginning pain severity was 6.5/10 and this reduced to 2.43/10 after treatment (p<.001, 2 tailed t test). See Figure 1. Average ketamine infusion time was 138 ml and the average dose of ketamine was 65.6mg. Side effects were transient "spaciness” in 9 patients and a sense of exhilaration in 4 more. No person fell asleep during treatment. In most cases, patients had a greater than #7/10 pain severity, and we stipulated that they do not drive to the clinic, but rather have somebody bring them.

We conclude that IV ketamine is an outpatient setting is not only very efficacious for reducing or abolishing refractory pain flareups, but is also quite safe and very well-tolerated. This opens up the possibility of using this agent on a routine basis, in sub-anesthetic dosages, to treat many different conditions in the setting of the clinic practice and the need for effective and safe agents to treat pain disorders is very basic or the practice.

DISCUSSION
The use of ketamine in pain syndromes has been published [1-12] before, although the literature is fairly sparse, considering the very large number of pain patients in society. We are extremely pleased with the degree of success in abolishing or reducing painful flareups without the need to use other medical therapies. We have demonstrated efficacy of memantine in treating refractory pain flareups in the clinic. It is quite efficacious, is tolerated well and has minimal transient side effects. The treatment should be closely monitored. Double-blind studies are clearly warranted for this unique agent.

CONCLUSIONS
IV ketamine is extremely effective for treating pain flareups. Ketamine can be used in the outpatient setting safely although monitoring is necessary. Painful conditions treated with IV ketamine were cervical pain and TMD, CRPS, and trigeminal neuralgia. No person fell asleep during treatment. In most cases, patients had a greater than #7/10 pain severity, and we stipulated that they do not drive to the clinic, but rather have somebody bring them.