with serious injuries was similar between regions, but rural patients were more likely to have abdominal and extremity injuries. The proportion of high-risk patients directly transported to major trauma centers was 29.4% in rural areas and 88.7% in urban areas. Overall mortality in rural areas was 1.44% compared to 0.89% in urban areas (p=0.09), including pre-hospital, ED and in-hospital mortality. The survival analysis showed no mortality difference between regions (HR, 0.83; 95% confidence interval [CI] 0.65%-2.21%). However, rural patients were more likely than urban patients to die during the first 24 hours (rural 0.65%; 95% CI 0.17%-1.13% versus urban, 0.13%; 95% CI 0.09%-0.16%).

The authors concluded that trauma patients who were injured in rural settings were less likely to be treated in major trauma centers, were more likely to die within the first 24 hours, and were more likely to require transfer over long distances. However, the overall mortality rate was similar for trauma patients in both rural and urban settings.

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Comment: Emergency medicine physicians who provide medical direction for rural EMS crews may consider providing additional training on field triage and transportation protocols to ensure early identification of patients who may benefit from early access to critical resources in order to expedite transport to major trauma centers.


Subanesthetic dose ketamine infusions have been well studied with good outcomes for multiple pain conditions, including complex regional pain syndrome, fibromyalgia and acute on chronic pain with opiate tolerance. This study examined the effect of subanesthetic dose ketamine infusions on patients suffering from chronic migraine (CM) or new daily persistent headache (NDPH) who had pain that was refractory to other treatments.

This was a retrospective review of in-network patients at a tertiary care hospital (Thomas Jefferson University Hospital) between 2006 and 2014 who were treated with intravenous (IV) ketamine following admission to the hospital for refractory CM or NDPH. In-hospital and post-hospital records were reviewed for details regarding pain, which was measured on a 0-10 scale. In order to qualify for the ketamine treatment protocol, patients had to fail preventative and acute headache treatment therapies as well as IV dihydroergotamine, IV lidocaine, neuroleptics and non-steroidal anti-inflammatory drugs at least once previously. Ketamine was administered by specialized pain nurses in an inpatient floor setting with standard monitoring. The starting dose was 0.1 milligrams per kilogram per hour (mg/kg/hr) with increases of 0.05 mg/kg/hr with a maximum dose of 1 mg/kg/hr. Up-titration was stopped for pain relief, nystagmus or mild inebriation and a 6-hour pause occurred at 0.25 mg/kg/hr to assess for side effects. Infusions were continued for a maximum of 5 days. Acute response was defined as a 2-point improvement in pain compared to the pain score reported at admission and sustained response was defined as an average pain at the first follow up appointment (within 1 month of discharge) that was 2-points less than the reported pain at admission. Analysis was performed using paired t-test.

A total of 77 patients ages 18 to 65 years were admitted for the ketamine protocol, 63 with CM and 14 with NDPH. The mean ketamine rate was 0.53 mg/kg/hr for a mean duration of 4.8 days. Mean headache pain on admission was 7.1 and mean headache pain on discharge was 3.8 for all patients, with a mean difference of 3.25 (95% CI 2.60-3.90). A subgroup was classified as acute responders and included 55 patients. The mean headache pain on admission for acute responders was 7.1 on admission and 2.5 on discharge with a mean difference of 4.57 (95% CI, 3.99-5.15). Of the acute responders, 15 continued to become chronic responders with a mean average pain of 5.2 at follow up. However, the mean difference was 2.633 (95% CI, 1.92-3.34), which was not statistically significant. A subgroup analysis by headache type revealed 8 of 14 patients with NDPH were acute responders (mean difference 4.25, 95% CI, 2.59-5.91) and 4 were chronic responders (mean difference 2.5, 95% CI, 0.91-4.09). Of patients with CM, 47 of 63 were acute responders (mean difference 4.63, 955 CI, 3.99-5.27) and 11 were chronic responders (mean difference 2.14, 95% CI, 0.91-3.37).

The authors concluded that subanesthetic dose ketamine can be used to successfully treat CM and NDPH that are refractory to other treatments, however the effects may not be long-lasting.

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Comment: This study provides important insight into the potential utility of subanesthetic doses of ketamine for the treatment of refractory headache. The study was performed in an inpatient setting over five days’ time, but additional research into the potential utility of the acute use of subanesthetic doses of ketamine for refractory headache in the ED may be beneficial.


Deep venous thrombosis (DVT) is associated with an increased risk of pulmonary embolism (PE). However, it was unclear to what extent cerebral venous thrombosis (CVT), another form of venous thromboembolism (VTE), was associated with a risk of subsequent PE. Pulmonary embolism was selected as the comparator given its risk for morbidity and mortality. This study was relevant given recent epidemiological data with higher than previously reported incidence of CVT.

This was a retrospective cohort study of anonymous claims data from all emergency departments in California, New York and Florida between 2005 and 2013 with a discharge diagnosis