



# Delirium Reduced with Intravenous Acetaminophen in Geriatric Hip Fracture Patients

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## Introduction

Post-operative delirium is associated with opioid use in the elderly and is a common complication of geriatric hip fractures with reported incidences from 16-70%. Intravenous (IV) acetaminophen is a safe and efficacious medication in elderly patients and has been shown to reduce use of opioids after hip fracture. At our institution, IV acetaminophen was administered in the first twenty-four hours post-operatively as part of a multi-modal pain control regimen for geriatric hip fractures patients. We hypothesized that this intervention may reduce the rate of delirium through decreased opioid consumption.

## Methods

A retrospective review of 123 hip fragility fracture patients over age 60 from January 2016 to December 2016 was performed. Patients were compared in terms of age, sex, pertinent baseline medical characteristics, pre-admission functional status and American Society of Anesthesiologists (ASA) classification. The protocols for pre-operative assessment, post-operative mobility, and geriatric co-management were consistent throughout the study period. Type of anesthesia administered, admitting service, fellowship training of attending surgeon, and number of opioid doses pre-operatively were also compared. Delirium was identified using a validated chart-based review tool. The rate of delirium, as well length of stay, pain scores, opioid administration, need for one-to-one supervision, and readmissions were compared.

## Results

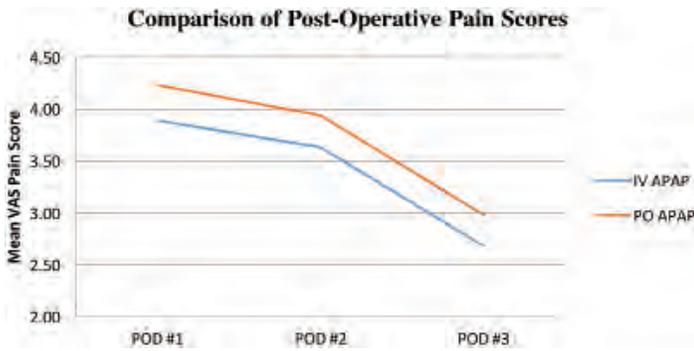
Sixty-five patients (52.8%) received IV acetaminophen during this period. There were no significant differences in baseline characteristics between groups. Ten out of 65 patients receiving IV acetaminophen post-operatively experienced delirium compared to 19 out of 58 who did not receive the medication (15.4% vs 32.8%,  $p = 0.024$ ). The IV acetaminophen group also required fewer doses of IV opioids on post-operative day 1 (0.37 vs 1.19 doses,  $p = 0.008$ ), were less likely to require one-to-one supervision (9.2% vs 24.1%,  $p = 0.025$ ), and had shorter lengths of hospital stay (6.37 vs 8.47 days,  $p = 0.037$ ). Groups had similar

surgical and anesthetic treatment, pre-operative opioid doses, and times from admission to the operating room. Patients were more likely to receive IV acetaminophen when admitted to the orthopaedic service compared to other services (57.7% vs 34.6%,  $p = 0.036$ ). Readmission rates and discharge dispositions did not vary with significance between the two groups.

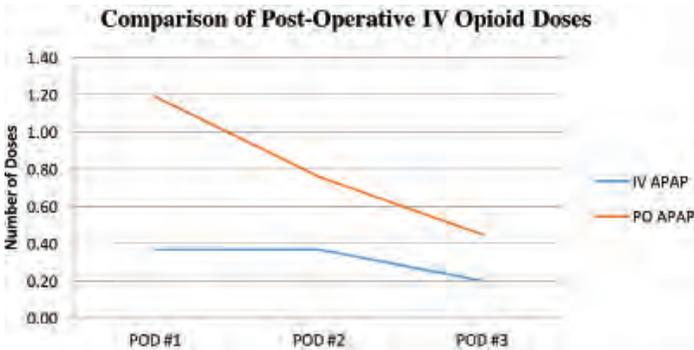
## Discussion

The results of this study indicate that IV acetaminophen can appropriately supplement opioid medication in providing adequate post-operative pain control as evidenced by significantly lower use of intravenous opioids on post-operative day one. As IV acetaminophen was only prescribed for 24 hours post-operatively, it follows that opioid utilization was not different on post-operative days two and three. The pain scores also show a non-inferiority compared to opioids in controlling surgical pain. The reduced use of opioids immediately after surgery may have been a large factor in reducing the rate of delirium in patients receiving IV acetaminophen. The rate of delirium in patients that did not receive IV acetaminophen is consistent with that cited in previous literature. Additional factors which could have predisposed patients to delirium including age, pre-existing medical conditions and pre-surgical opioid administration, amongst others, were compared and not found to be different between the two groups. A greater proportion of patients that were admitted to the orthopaedic service received IV acetaminophen. We believe this is a result of increased familiarity of this medication availability for hip fracture patients amongst the orthopaedic providers compared to other services.

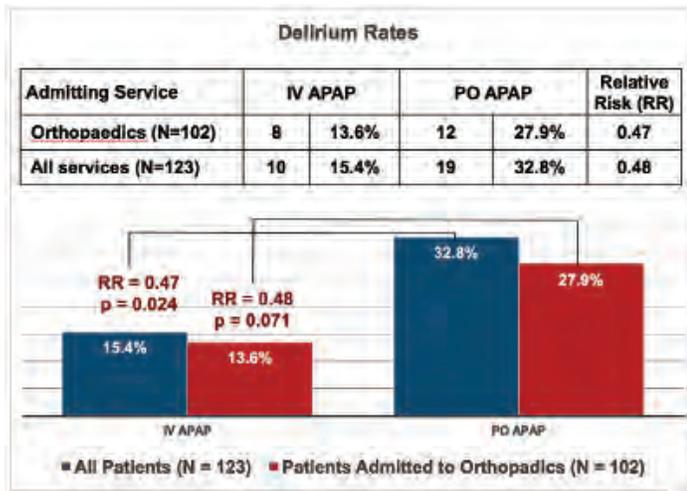
The standard practice at our institution for patients presenting with a geriatric hip fracture is admission to the orthopaedic service with co-management by a geriatric consult team. Deviations from our standard pathway are medically indicated in select cases and accounted for only 17% of patients in this series. An analysis of only patients admitted to the orthopaedics service was performed. The analysis showed a nearly identical reduction of more than 50% in the rate of delirium. This subgroup analysis, along with no other differences in patient



**Figure 1.** Comparison of Post-Operative Pain Scores. VAS—Visual Analog Scale. POD – Post-Operative Day.



**Figure 2.** Comparison of Post-Operative Opioid Use. VAS – Visual Analog Scale. POD—Post-Operative Day.



**Figure 3.** Delirium Rates and Relatively Risk of Delirium with IV Acetaminophen in Patients Admitted to the Orthopaedic Service and All Patients.

characteristics between the two groups, leads the authors to conclude that the effect observed in this study was largely a result of the IV acetaminophen administration.

The difference in secondary outcomes implies that the use of IV acetaminophen may lead to a cost savings, despite a higher medication cost per dose, through reduced need for one-to-one supervision and shorter hospital stays. In our review, patients who became delirious had hospital stays that were nearly 2.5 times longer than those that did not. Other

studies have also shown that delirium independently leads to increased mortality in hip fracture patients.

### Conclusion

Delirium is a prevalent complication in geriatric hip fractures and has a detrimental effect on patient recovery. Prevention requires a skilled medical and surgical team and use of appropriate treatment modalities. The inclusion of IV acetaminophen in a post-operative opioid-sparing pain protocol can lead to less use of opioid medication after surgery and subsequently lower rates of delirium in the geriatric hip fracture population. This effect may reduce the utilization of inpatient resources for direct patient supervision and provide for shorter hospital stays.

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