

**2018 ACMT Annual Scientific Meeting
FIT MedTox Shark Tank Research Forum**

Presentation 4

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Title: Accounting for the Variability of the Osmolal Gap in Acute Ethanol Intoxication

Background: Acute ethanol intoxication is the most common cause of elevations in the serum osmolal gap, even in non-toxic ingestions. As such, a frequent finding among patients presenting with elevated ethanol levels is an elevated osmolal gap, which is not always accounted for by calculating ethanol's expected contribution to the predicted osmolal gap. This unexplained osmolal gap is a concern to clinicians who are forced to look for other osmotically active substances to explain this elevation; the most clinically concerning being the toxic alcohols, such as methanol and ethylene glycol. As presentations involving ethanol are common, there is a need to reduce unnecessary screening (via toxic alcohol laboratory panels), antidote use (alcohol dehydrogenase inhibitors), and treatment (hemodialysis) in patients with isolated ethanol ingestion. Various investigators have attempted to identify a better coefficient for ethanol in calculating the osmolal gap, but have been limited by the variability in vivo and lack of a linear correlation between measured osmolality and predicted osmolality in the presence of ethanol.

Aims: To determine the variable effect of ethanol on the osmolal gap at different ethanol levels and over time, in order to find a more specific coefficient for ethanol in the formula for calculated osmolality.

Methods: We will conduct a prospective cohort study of acutely intoxicated subjects. 22 healthy volunteers will be given weight-based doses of ethanol to achieve a serum level of 200 ng/dL. They will have serial blood draws with concurrent measurement of their serum ethanol level, serum BUN level, serum sodium level, serum glucose level, and serum osmolality. Measured serum osmolality will then be compared to calculated serum osmolality, and multiple linear regressions will be utilized to determine the effect of ethanol levels on serum osmolality. We will also utilize time since initial drink as a variable to account for the metabolism of alcohol. We will examine all subsets of variables and choose between them by balancing the minimization of training error and model complexity.

Major Limitations/Questions: The osmotically active substance that corresponds to this osmolal gap discrepancy is currently unknown. Serum ethanol level of 200 ng/dL may not be high enough to sufficiently demonstrate unexplained osmolal gap, which has been most frequently seen at high ethanol levels. Study subjects being healthy volunteers without alcohol

use disorder may not correlate identically to the typical patient who presents to the ED with a high serum ethanol level.