

CLINICAL VIGNETTE

A Case of Hand Sanitizer Intoxication

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Introduction

Alcohol intoxication is a common problem seen in hospitals across the country. While many practitioners are comfortable handling the withdrawal process, there is often a question of patients obtaining alcohol while their withdrawal is being managed as an inpatient. This article presents a case of an inpatient ingesting hand sanitizer as a form of alcohol during his inpatient withdrawal.

Case Presentation

Initial Presentation

The patient was brought to the hospital by police, clearly intoxicated. He believed his last drink was in the last two days and that he had not eaten for six days.

The patient also complained of abdominal pain associated with vomiting for three days. His pain surrounded the umbilicus and radiated to his sternum. He reported a similar pain previously. He was in enough pain that he stopped drinking for periods of hours in the prior days. On review of systems, the patient also reported a chronic non-productive cough and increased urinary frequency. Although denying any current suicidal ideation, the patient reported significant depression regarding his son who had cut off contact in the prior year. He is homeless and has multiple past suicide attempts including one attempted overdose on chlordiazepoxide prescribed following a previous withdrawal.

It was noted that the patient had been admitted the month prior for alcohol withdrawal and had a documented history of previous withdrawal symptoms. When confronted, he acknowledged a 35 year history of alcohol abuse with a daily drinking of 4/5ths of a liter of vodka per day. He has previously resided in an alcohol treatment facility in the past.

His vital signs were notable for a pulse of 130, BP of 120/95 a respiratory rate of 18 while afebrile. On physical exam, he was obviously intoxicated and smelling of alcohol. Cardiovascular and pulmonary exams were within normal limits. On abdominal

exam, the patient had moderate right upper quadrant tenderness with a positive Murphy sign. He also had a mild tremor with his hands outstretched but no asterixis.

Laboratory studies are listed below.

Laboratory Study	Serum Level
Sodium	142 mEq/L
Potassium	4.5 mEq/L
Chloride	100 mEq/L
CO2	27.8 mEq/L
BUN	8 mEq/L
Creatinine	0.78 mEq/L
Glucose	124 mEq/L

Hemoglobin	14 g/dl
WBC	12.73 thousand/mm ³
Platelet	334 thousand/mm ³

ALT	49 IU/L
AST	62 IU/L
Alkaline phosphatase	54 IU/L
Total bilirubin	0.49 mg/dl
Albumin	4.2 g/dl

Lipase	13 IU/L
Lactate (initial)	2.9 mmol/L
Lactate (after fluids)	1.8 mmol/L

EtOH Date Drawn	EtOH Level
Day 1	177 mg/dl
Day 5	360 mg/dl
Day 7	283 mg/dl

Psychiatric History

The patient has a history of bipolar I with his last manic episode earlier this year. He believes that his drinking is not a central problem in his life but rather a symptom of psychiatric problems he is not being adequately treated for. In addition to

the prior suicide attempt by overdose, he attempted suicide eight years prior by cutting his wrists. He suffers from intermittent visual hallucinations although it is unclear if this is related to his alcohol consumption. Psychiatry noted a high chronic risk but low acute risk for suicide. While an inpatient he was restarted on his outpatient medications which he takes with questionable compliance: valproic acid, olanzapine, trazodone and gabapentin.

Hospital Course

While in the ED, the patient oxygen desaturation to mid-70s with recovery to mid-90s. His nurse reported that the patient was drinking from the hand sanitizer dispenser although this was not known by the medicine team upon admission. Folate, thiamine and saline were given in the ED. He also developed atrial fibrillation with rapid ventricular response with a rate of 155 that was stabilized with diltiazem. Given the concern for potential sepsis with the elevated WBCs, HR and RR, blood and urine cultures were drawn and ceftriaxone was administered with maintenance fluids.

Once on the general medicine floor, the patient was started on lorazepam as needed and as well as a chlordiazepoxide taper. He was intermittently somnolent while on the floor but at times became lucid. On the second day of hospitalization, it was noted that the patient would leave his room periodically. At this time there was suspicion he may be attempting to drink although the source was unclear given that there was no location to purchase alcohol on premises.

By the third day of hospitalization, nursing staff had noticed the patient filling cups with hand sanitizer although they did not directly observe him drinking it. The hospital hand sanitizer was an ethanol based formulation. The staff removed the hand sanitizer from dispensers around the room, but they subsequently observed him walking further down the hallway to get the sanitizer from other dispensers. When confronted by staff he claimed he was using it to clean his feet.

On day 5 of hospitalization, the patient was found to be vomiting early in the morning and smelt of alcohol. When asked by nursing staff, he quickly took a bottle of hand sanitizer from the bedside drawer and walked into the bathroom where the nurse saw him putting something in his mouth. The staff told him that he would likely be discharged at this time, and he started shouting expletives as he left the ward.

When the house staff arrived, he was walking back to the ward. He acknowledged drinking hand sanitizer from the multiple bottles in the hallway. His serum ethanol level was 360 mg/dl and he appeared increasingly intoxicated. He was seen taking hand sanitizer from the nurses' station and refused to return it. When confronted, the patient placed one of the nursing staff in a headlock. During subsequent psychiatric assessment, the patient made verbal threats to the staff. He was closely monitored and follow up assessment two hours later found the patient somnolent in bed while watching television. He was

later discharged once he was no longer intoxicated and was deemed to not be a threat to others since he sobered.

Discussion

Alcohol intoxication is a significant problem in the United States with over 600,000 ED visits a year attributable to acute intoxication.¹ 9.8% of deaths among adults 20-64 in the United States were caused by excessive drinking², and 14% of American adults met criteria for an alcohol use disorder as defined in DSM-5.³ Given the prevalence of alcohol use and abuse, it is common that patients with alcohol use disorders are in health care settings with hand sanitizers.

Toxicity from hand sanitizer is most commonly due to accidental ingestion by children.⁴ A retrospective review of sanitizer exposure in Texas during 2006 and 2007 found that the majority of exposures did not lead to any effect in children.⁵ While this is encouraging with minimal systemic toxicity of ethyl alcohol present in these sanitizers, little work has investigated ingestion for inebriation. A 2015 report describes a 7 year old with acute alcohol intoxication.⁶ Additionally, another report from 2013 presented a patient in a locked psychiatric facility, who extracted alcohol from hand sanitizer using table salt and consumed two 1L bags of hand sanitizer.⁷ This patient was intubated and managed in an ICU setting following a blood ethanol level of 382 mg/dl.⁷ The method of extraction was subsequently validated experimentally.⁷ Another report shows the potential lethal nature of hand sanitizer intoxication.⁸ A 36 year-old man presented to the ED with alcohol intoxication and an ethanol level of 278 mg/dl.⁸ Following management of his intoxication, he drank hand sanitizer from the ED waiting room and was found down with an ethanol level of 526 mg/dl after which he died.⁸

A population review in 2012 found that the incidence of hand sanitizer intoxication climbed significantly from 2005 to 2009 with an average increase of 1,894 cases per year.⁹ Given the universal importance placed on hand hygiene within hospitals, it is likely that the exposure risk will be persistent in healthcare facilities.

A simple look at one common model shows that a single dispenser has a volume of 1200 ml and an ethanol concentration of 62%. This is equivalent to commercially available quantities of hard liquor.

Hand sanitizers most often contains either ethanol or isopropyl alcohol. Our facility had an ethanol based formulation. Ingestions of ethanol based hand sanitizer should generally follow the general treatment of ethanol intoxication. Fortunately for the clinician, readily available serum ethanol assays are convenient and reliable in aiding the diagnosis. However, the meaning of these serum values must be interpreted in the context of alcohol use history as both intoxication levels and rates of elimination vary based on previous tolerance.⁹ Observed symptoms and physical

manifestations of alcohol often do not correlate with serum lab values, especially in chronic drinkers.¹⁰ As a general rule, the most important part of caring for a patient with acute ethanol intoxication is protection of respiratory function with possible intubation given the CNS depressant effects of ethanol. Unfortunately, interventions to prevent absorption such as activated charcoal are ineffective given the rapid absorption of ethanol.

Hand sanitizers that contain isopropyl alcohol can be particularly life threatening. A case report from 2007 demonstrates the danger with a 43 year old man who became acutely hypotensive and delirious following isopropyl alcohol consumption.¹¹ He required emergent dialysis.¹¹ While many clinicians may not be aware of the dangers of isopropyl alcohol, it is recognized that a dose of 150-250 ml can be lethal secondary to CNS depression and cardiovascular collapse.¹² It is often difficult to distinguish isopropyl alcohol toxicity from other conditions; however, increased serum acetone levels in isolation without metabolic acidosis is a key finding given that isopropyl alcohol is not converted into an organic acid.¹² It is important to distinguish an osmolar gap greater than 15 mOsm/kg which points to ingestion of methanol, isopropyl alcohol or ethylene glycol.¹² Treatment can range from supportive care with fluids to emergent hemodialysis depending on patient status.¹²

This case is a clear demonstration of the danger of ethanol intoxication in the setting of hand sanitizer ingestion. Clinicians should have this possibility on their differential when a patient appears to have an increasing ethanol level while an inpatient. It may even be advisable to prophylactically remove hand sanitizers from the immediate area surrounding a patient's room if that patient is known to have a particularly severe alcohol use disorder.

REFERENCES

1. **Pletcher MJ, Maselli J, Gonzales R.** Uncomplicated alcohol intoxication in the emergency department: an analysis of the National Hospital Ambulatory Medical Care Survey. *Am J Med.* 2004 Dec 1;117(11):863-7. PubMed PMID: 15589492.
2. **Stahre M, Roeber J, Kanny D, Brewer RD, Zhang X.** Contribution of excessive alcohol consumption to deaths and years of potential life lost in the United States. *Prev Chronic Dis.* 2014 Jun 26;11:E109. doi: 10.5888/pcd11.130293. PubMed PMID: 24967831; PubMed Central PMCID: PMC4075492.
3. **Grant BF, Goldstein RB, Saha TD, Chou SP, Jung J, Zhang H, Pickering RP, Ruan WJ, Smith SM, Huang B, Hasin DS.** Epidemiology of DSM-5 Alcohol Use Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry.* 2015 Aug;72(8):757-66. doi: 10.1001/jamapsychiatry.2015.0584. PubMed PMID: 26039070; PubMed Central PMCID: PMC5240584.
4. **Santos C, Kieszak S, Wang A, Law R, Schier J, Wolkin A.** Reported Adverse Health Effects in Children from Ingestion of Alcohol-Based Hand Sanitizers - United States, 2011-2014. *MMWR Morb Mortal Wkly Rep.* 2017 Mar 3;66(8):223-226. doi: 10.15585/mmwr.mm6608a5. PubMed PMID: 28253227.
5. **Miller M, Borys D, Morgan D.** Alcohol-based hand sanitizers and unintended pediatric exposures: a retrospective review. *Clin Pediatr (Phila).* 2009 May;48(4):429-31. doi: 10.1177/0009922808330781. Epub 2009 Feb 19. PubMed PMID: 19229062.
6. **Hertzog JH, Radwick A.** Acute alcohol intoxication in a child following ingestion of an ethyl-alcohol-based hand sanitizer. *Int J Clin Pharmacol Ther.* 2015 Jul;53(7):557-60. doi: 10.5414/CP202362. PubMed PMID: 25943177.
7. **Darracq MA, Ghafouri N, Pesce A, Cantrell FL.** Hand sanitizer intoxication following a crude extraction method. *Am J Drug Alcohol Abuse.* 2013 May;39(3):217-8. doi: 10.3109/00952990.2013.773335. PubMed PMID: 23721538.
8. **Schneir AB, Clark RF.** Death caused by ingestion of an ethanol-based hand sanitizer. *J Emerg Med.* 2013 Sep;45(3):358-60. doi: 10.1016/j.jemermed.2013.03.018. Epub 2013 May 22. PubMed PMID: 23706595.
9. **Bogusz M, Pach J, Staško W.** Comparative studies on the rate of ethanol elimination in acute poisoning and in controlled conditions. *J Forensic Sci.* 1977 Apr;22(2):446-51. PubMed PMID: 618161.
10. **Olson KN, Smith SW, Kloss JS, Ho JD, Apple FS.** Relationship between blood alcohol concentration and observable symptoms of intoxication in patients presenting to an emergency department. *Alcohol Alcohol.* 2013 Jul-Aug;48(4):386-9. doi: 10.1093/alcalc/agt042. Epub 2013 May 19. PubMed PMID: 23690233.
11. **Emadi A, Coberly L.** Intoxication of a hospitalized patient with an isopropanol-based hand sanitizer. *N Engl J Med.* 2007 Feb 1;356(5):530-1. PubMed PMID: 17267921.
12. **Zaman F, Pervez A, Abreo K.** Isopropyl alcohol intoxication: a diagnostic challenge. *Am J Kidney Dis.* 2002 Sep;40(3):E12. Review. PubMed PMID: 12200829.

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