

Intentional ingestion of hand sanitizer in an adult psychiatric unit

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Abstract

Intentional ingestion of ethanol- or isopropanol-based hand sanitizer has been reported in the literature in a variety of settings within the health care system. Specifically in psychiatric units, case reports have only described ingestion of ethanol-based products. This report describes a case of intentional ingestion of isopropanol-based hand sanitizer by a patient while hospitalized on a psychiatric unit. The patient developed acute respiratory failure, acute kidney injury, and metabolic encephalopathy and was treated for 3 days in the intensive care unit before returning to the psychiatric unit. This case highlights the process of identifying suspected ingestion while hospitalized. In any patient who has a sudden change in level of consciousness, clinicians should consider the potential for ingestion of ethanol- or isopropanol-based hand sanitizer. Facilities should be aware of how accessible hand sanitizer is, particularly in areas with patients who have a history of substance dependence.

Keywords: isopropanol, ingestion, hand sanitizer, toxicity, psychiatric

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Background

Isopropanol (isopropyl alcohol) and ethanol-based hand sanitizers are readily available in most health care settings as advised by the World Health Organization¹ and Centers for Disease Control² guidelines for hand hygiene. Toxicity with isopropanol has been reported in the literature resulting from both intentional and accidental ingestions. According to a query of the American Association of Poison Control Centers' National Poison Data System, of all exposures to alcohol-based hand sanitizer in those age 20 years and older between 2005 and 2009, most exposures were unintentional (78%), 13% were considered intentional, and 9% were not specified.³

Alcohol-based hand sanitizers typically contain 60% to 95% ethyl alcohol or isopropanol.⁴ Symptoms from isopropanol oral ingestion appear within 30 to 60 minutes.⁵ The half-life of isopropanol in humans ranges from 2.5 to 8 hours, and it is eliminated by first-order pharmacokinetics.⁶ Isopropanol's metabolite acetone is also eliminated by first-order pharmacokinetics and has a half-life elimination of about 24 hours.⁶⁻⁸

Although acetone may contribute to clinical toxicity, it is believed that most symptoms arise from isopropanol toxicity, which include central nervous system depression, hypotension, hypothermia, and decreased respiratory drive.⁶ Gastrointestinal and renal effects may also be observed.⁵ Central nervous system effects include changes in mental status, loss of coordination, slurred speech, and coma.⁵ The severity of toxicity may not correlate with isopropanol serum concentrations, and the dose necessary to cause significant toxicity has not been defined.^{6,7} Toxicity is more likely with isopropanol concentrations above 50 mg/dL, and coma may occur if concentrations exceed 150 mg/dL.⁶ Acetone levels peak 7.5 to 30 hours after ingestion, but other signs, such as unexplained

osmolal gap, presence of acetone in blood or urine, and lack of other causes of ketosis, may assist in the diagnosis of isopropanol toxicity.^{5,6} Supportive care, including airway management, intravenous fluid administration, and monitoring of cardiovascular status is recommended in cases of isopropanol toxicity.⁶ Hemodialysis can be used in cases of severe toxicity.⁵ We report a case of a patient admitted to an acute psychiatric unit who required intubation following intentional ingestion of isopropanol-containing hand sanitizer while hospitalized.

Case Report

A 40-year-old female on an inpatient adult psychiatric unit with a past medical history of depression with 1 previous suicide attempt, polysubstance abuse, posttraumatic stress disorder, insomnia, neuropathic pain, anxiety, hyperlipidemia, and gastroesophageal reflux disease was found with a decreased level of consciousness and an oxygen saturation of 88% on room air. After a rapid response was called, she was intubated, taken to the emergency room, and admitted to the intensive care unit (ICU) for acute respiratory failure, acute kidney injury, and metabolic encephalopathy.

Two days earlier, the patient was brought to the emergency room by emergency services after a suicide attempt by reportedly ingesting one hundred twenty 300-mg capsules of gabapentin, twenty 1-mg capsules of prazosin, an unknown quantity of methamphetamine, ethanol, and hand sanitizer 1 h prior to arrival. The gabapentin bottle was brought to the emergency room, and it was estimated that 87 capsules were ingested. Activated charcoal was administered along with 1 L of intravenous (IV) normal saline, 1 mg IV lorazepam, and 4 mg IV ondansetron. The patient was alert and vital signs were stable during 6 hours of observation in the emergency department, and the patient was admitted to the inpatient adult psychiatric unit.

During the initial admission to the inpatient psychiatric unit, the patient exhibited agitated behavior early in the admission, ripping hand sanitizer units off the walls. She required 1 oral dose of olanzapine 10 mg, hydroxyzine 50 mg, hydroxyzine 100 mg, clonidine 0.1 mg, and chlordi-azepoxide 10 mg for anxiety, agitation, and per protocol for ethanol withdrawal. She was also started on levetiracetam, acamprosate, thiamine, magnesium oxide, multivitamin, sertraline, trazodone as needed (never received), gabapentin, simvastatin, transdermal nicotine, and pantoprazole.

In the ICU, her initial blood pressure and heart rate were 139/89 mm Hg and 105 beats/min, respectively, and temperature was 97°F. On physical exam she had mottling

of the skin on her knees and was cold to touch. An electrocardiogram revealed a normal rhythm with sinus tachycardia. A computed tomography of the head was normal. A liver function panel, ammonia, and basic metabolic panel were normal except for a serum creatinine of 1.82 mg/dL (baseline: 0.73 mg/dL). The calculated serum osmolality was 292 mOsm/kg (normal range: 280 to 308 mOsm/kg), and the measured serum osmolality was 361 mOsm/kg. Lactic acid was 2.5 mmol/L (normal range: 0.4 to 2 mmol/L). The urine drug screen was positive for amphetamines, benzodiazepines, and cannabinoids, which was unchanged from findings on initial admission 2 days earlier. A urinalysis was unremarkable except for a specific gravity <1.005 (normal range: 1.001 to 1.034). Blood cultures and rapid plasma reagin were negative. Serum ethanol was undetectable both on admission and following transfer to the ICU. Twelve to 16 hours after the suspected ingestion, serum isopropanol and acetone isopropyl metabolite were 27 mg/dL (not detected: <10 mg/dL) and detected (not detected: <10 mg/dL), respectively. Serum isopropanol and acetone isopropyl metabolite were not collected on admission.

After administration of 1 L boluses of normal saline and 5% dextrose in water (D5W) with multivitamins and thiamine on day 1, maintenance fluids with lactated ringers and D5W were infused at 75 mL/h. On day 2, dexmedetomidine was started. No seizure activity was found on electroencephalogram. Serum creatinine peaked on day 2 of ICU admission at 2.38 mg/dL and returned to baseline by the day of ICU discharge. She was extubated on day 3 of her ICU stay. When the patient regained consciousness, she confirmed the ingestion of hand sanitizer. Upon discharge from the ICU, she was readmitted to the inpatient psychiatric unit to continue treatment of major depressive disorder.

Discussion

Numerous cases describing intoxication from intentional ingestion of ethanol- or isopropanol-containing hand sanitizers have been reported in the literature. These have occurred in a variety of settings, including emergency rooms,^{5,9,10} general hospital rooms,^{3,7,11-15} prison,¹⁶ and acute psychiatric or inpatient substance abuse units.¹⁷⁻²⁰ Emadi and Coberly²³ described the case of a patient who was admitted for chest pain who became hypotensive with altered mental status. His serum isopropanol concentration was 13.6 mg/dL with a measurable acetone concentration.²³ He recovered from the intentional ingestion with supportive care including vasopressors and IV fluids.²³ Shetty et al²² described a case of isopropanol ingestion in a hospitalized 24-year-old man who developed ventricular tachycardia and fibrillation

with severe metabolic acidosis. Isopropanol concentrations were not listed in this case, but his gastric lavage revealed the presence of isopropanol.¹² He required hemodialysis for the acidosis but died as the result of hypoxic brain injury resulting from cardiac arrest.¹² Thanarajasingam et al⁷ described a patient who was admitted to the emergency department with acute confusion and signs of intoxication and was found to have ingested isopropanol (isopropanol level 100 mg/dL, acetone 207 mg/dL). The patient improved with IV fluids and did not require intubation.⁷ He had a worsening of his mental status following this improvement, and tests subsequently revealed an elevated serum ethanol concentration, presumably obtained from ethanol-based hand sanitizer available in his hospital room after the original ingestion.⁷ Gaudet and Fraser⁵ described a case of ingestion of 70% isopropanol resulting in loss of consciousness, no response to deep pain, and requiring intubation but not mechanical ventilation. The isopropanol concentration was measured at 300 mg/dL. The patient improved with supportive measures after 24 hours.⁵ Although there have been several cases describing isopropanol-based ingestion, none have been reported in an inpatient psychiatric unit.

When ingestion is suspected, the process of identifying the substance is critical. Although the isopropanol level in our patient was not elevated to the toxic levels reported in the literature, it was obtained approximately 12 to 16 hours after the suspected ingestion. Serum acetone concentrations were not quantified, but they were present, supporting the timing of the ingestion. Our patient had an osmolal gap of 69 mOsm/kg (normal: <10 mOsm/kg) and presence of serum isopropanol and acetone. These findings are also helpful in supporting the diagnosis of isopropanol toxicity.

Our patient's serum creatinine was elevated after the ingestion and continued to rise, indicating acute kidney injury, but false elevations have been observed with isopropanol toxicity.²¹ Her renal function eventually returned to baseline.

Reevaluating the access to hand sanitizers in areas where patients are receiving care for psychiatric conditions is important to combat the issue of ingestion.^{9,17} Various procedural changes have been implemented at facilities, including limiting the quantity available, making bottles unable to be removed from the dispenser, and limiting placement in areas with high-risk patients, such as those who are psychiatrically unstable or those with a history of substance abuse and dependence.^{10,17} In our case, hand sanitizer was not available in areas other than the monitored dining area from a secured dispenser, but the patient was still successful in accessing enough to become significantly intoxicated.

Conclusion

Facilities should be aware of the potential concern of access to ethanol- or isopropanol-based hand sanitizer, particularly in patients with a history of substance dependence. Even when appropriate measures are implemented, isopropanol toxicity should be considered in any hospitalized patient with a sudden change in level of consciousness.

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