



# Hot Tub Syncope: Uncommon, but not always Harmless

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## Abstract

Hot tub syncope can result in drowning. With immersion in a hot tub, the high external water temperature, as compared to the body, causes an initial rise in heart rate and blood pressure. However, after the first several minutes of autonomic regulation, the body acclimates to these higher temperatures through peripheral vasodilation to decrease the heat burden. The heart rate also falls. On exiting the hot tub, if the body cannot respond with a sufficiently compensatory increase in parasympathetic tone causing vasoconstriction, syncope can result. This is more likely to occur if the water temperature is set high, and with prolonged immersion. Several precautionary measures are suggested.

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## Introduction

Hot tub drownings are disastrous events that are occasionally reported. In Japan, where the use of hot tubs is widely prevalent, there were 4866 people who drowned in a hot tub in 2014 alone, according to Japan's Consumer Affairs Agency [1]. In the United States, the Scripps Howard News Service Study of the Federal Mortality Records found 1676 deaths occurred in a hot tub between the years 1999 and 2003, averaging 335 deaths per year [2]. Syncope in the hot tub would result in drowning and has therefore become a topic of interest. We present here a case of recurrent syncope and dizziness related to the use of a hot tub.

## Case presentation

The patient is a 71-year-old gentleman who presented to the Emergency Department (ED) after a fall resulting in a scalp laceration and nasal fracture. He was admitted for further evaluation. Patient reported 12 falls in the last 2 years. He did not seek medical attention until this last event. He stated his falls began after he and his wife purchased a hot tub. The falls have been accompanied by dizziness upon standing up in the tub or having just exited. During this most recent episode, he was sitting with his wife in the hot tub for over an hour. When he stood up to exit, he remembers feeling lightheaded and dizzy. He then



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awoke on the brick floor face down. The patient also reported one episode of light-headedness in the past year while taking a hot shower. He denied any cardiac or neurological problems in the past. In the ED his blood pressure was 110/68 mm Hg, his heart rate was 76 beats per minute, and his temperature was normal. His physical examination revealed a one-inch laceration on the right side of the scalp, with bruising over the nose. No other abnormalities were noted. Laboratory tests revealed a mild anemia, with a hemoglobin of 11.3 g/dl. His electrolyte levels and complete metabolic profile were within the normal range. His electrocardiogram was normal. His echocardiogram was normal with an ejection fraction of 55-60%. Extended telemetry failed to reveal any arrhythmia. CT of the head revealed bilateral nasal bone fractures without displacement. Neurological examination was unremarkable. The patient's scalp laceration was sutured. No particular intervention was undertaken for the nasal fracture. The patient was provided with precautionary information regarding the use of his hot tub. He was advised to keep his hot tub temperature below 104°F. In addition, he was asked to limit his immersion to less than 15 minutes at a time and to not stand up abruptly in the hot tub. He was also asked to sit on the edge of the hot tub and to dangle his feet outside for several minutes before walking away. We also recommended that he not use the hot tub when he is alone. Over the 18 months since his presentation to the ED, the patient has not experienced any recurrence of syncope.

### Discussion

Hot tub syncope can be regarded as both situational and vasovagal. Situational syncope has been referred to as Gower's Syndrome, and is caused by a reflex response leading to cerebral hypoperfusion [3]. These reflex responses can occur in a variety of situations. An event or stimulus triggers the activation of the parasympathetic nervous system leading to bradycardia, systemic vasodilation and hypotension. This leads to a reduction in cerebral blood flow and overall decrease in oxygen delivery to the neurons in the brain stem responsible for regulating consciousness, the reticular activating system [3]. Some situations, such as micturition and swallowing appear to trigger only the neural reflex response. Others, such as coughing, squatting or prolonged straining (such as on the toilet, weightlifting or playing brass instruments), cause syncope by additional mecha-

nisms as well. Based on reports in current literature, the most common events known to trigger situational syncope are micturition, coughing, sneezing, swallowing and weightlifting [4]. With immersion in a hot tub, the high external temperature of the water causes the heart rate and blood pressure to initially rise. However, after the first several minutes of autonomic regulation, the body acclimates to the higher temperature through peripheral vasodilation to decrease heat burden and by decreasing the heart rate. On leaving the hot tub, if the body cannot respond with a sufficiently compensatory increase in parasympathetic tone causing vasoconstriction, syncope can result. This is more likely to occur if the water temperature is over 104 degrees Fahrenheit and with prolonged immersion [5].

### Conclusion

Syncope from immersion in a hot tub is uncommon but can be deadly. Most often, syncope occurs when the person stands up and is leaving the hot tub. Higher water temperature and prolonged immersion appear to increase the risk. After cardiac and neurologic disease has been ruled out and hot tub immersion has been identified as the trigger for syncope, precautionary advice can be provided to the patient. This includes keeping the water temperature below 104 degrees Fahrenheit, limiting immersion time to 15 minutes at a time and finally exiting cautiously allowing the body to adapt.

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