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Brief Report

Injury patterns and outcomes of ice-fishing in the United States☆

Cornelius A. Thiels, DO [a,b], Matthew C. Hernandez, MD [a], Martin D. Zielinski, MD [c], Johnathon M. Aho, MD [a,d,*]

[a] Department of Surgery, Mayo Clinic
[b] Mayo Clinic Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery
[c] Division of Trauma, Critical Care, and General Surgery
[d] Biomedical Engineering and Physiology

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ABSTRACT

Introduction: Fishing is a common pastime. In the developed world, it is commonly performed as a recreational activity. We aim to determine injury patterns and outcomes among patients injured while ice fishing.
Methods: Data on initial emergency department visits from the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) from 2009–2014 were analyzed. All patients with fishing related injuries were included. Primary endpoint was rate of admission or transfer. Secondary endpoints were defined a priori anatomical injury categories and patients were assigned into groups. Descriptive and power analysis was performed between patients with ice-fishing and traditional fishing related injuries.
Results: We identified 8220 patients who sustained fishing related injuries, of which n = 85 (1%) involved ice fishing. Ice fishing injuries occurred primarily in males (88%) with a mean age of 39.4 years ± 17.5 (std dev). The most common injuries related to ice fishing were: orthopedic/musculoskeletal (46%), minor trauma (37%), and major trauma (6%). Hot thermal injuries (burns) were the fourth most common type of ice-fishing injury (5%) but rarely occurred in warmer fishing months (<1%, P = .004). Cold thermal injuries (1%) and hypothermia (0%) were rare among ice-fishing injuries and immersion/drowning occurred in 5% of cases. The rate of admission/transfer was significantly greater in ice-fishing (11%) than the traditional fishing patients 3%, (P < .001), power was 90%.
Conclusion: Ice fishing is associated with more severe injury patterns and more thermal injuries and immersion injuries than traditional fishing. Providers and participants should be aware of the potential risks and benefits and counseled appropriately.

1. Background

Fishing has been a common activity throughout human history. First used as a means of providing food to survive, it has since evolved into a recreational activity in the developed world. In the United States (US), outside of commercial fishing, it is commonly performed as a hobby or for sport. While commercial fishing is a hazardous occupation [1], it is unclear what risk recreational fishing presents in terms of injury patterns. The literature is limited to case reports and case series of isolated injuries, or high level epidemiological studies [2–6]. While traditional fishing is often associated with minor injuries such as hook punctures, the types of injuries associated with ice-fishing, with its unique environmental risks, is largely unknown [7].

In northern climates, fishermen routinely trek onto frozen bodies of water to fish for both sport and recreation. Commonly called ice-fishing, it is performed via a hole dug or cut through the ice, usually with an auger, to access the water below. Although the risk of submersion injuries is present in ice and traditional fishing, cold water poses additional risk of hypothermia. In addition, the cold atmospheric environment presents a high risk of hypothermia and frostbite. While individual practices vary, it is common to erect a soft or hard structure for shelter from the environment. Ice fisherman will often heat these structures with portable heaters, which are at risk of failing, exploding, catching fire, and causing inhalation injuries. All of these factors may pose additional risk when ice-fishing that may not be present during traditional fishing. The risk of these injuries, is unknown. We aim to identify injury patterns sustained by ice fishermen compared to traditional (non-ice) fishing in the US in an effort to increase awareness and drive evidence based injury prevention.

Abbreviations: ED, Emergency Department; NEISS-AIP, National Electronic Injury Surveillance System-All Injury Program; CDC, Centers for Disease Control and Prevention; US, United States.

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* Corresponding author at: Mayo Clinic, 200 First St. Southwest, Rochester, MN, 55905. Tel.: +1 507 255 3812.
E-mail address: aho.johnathon@mayo.edu (J.M. Aho).

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2. Methods

Data on initial emergency department (ED) visits was obtained from the National Electronic Injury Surveillance System-All Injury Program (NEISS-AIP) from 2009–2014 and all patients with fishing related injuries were included (US Consumer Product Safety Commission [CPSC] diagnosis code 3223). NEISS is a collaborative between the Centers for Disease Control and Prevention (CDC), National Center for Injury Prevention and Control, and the Consumer Product Safety Commission and collects data on initial US emergency room visits for all types of nonfatal injuries and poisonings [8]. Detailed information on the NEISS sampling methodology has been previously published [9,10].

In summary, data are drawn from a nationally representative subsample of over 100 hospitals that have 6 or more beds and a 24-hour ED across a wide variety of geographic regions. Trained abstractors extract information from ED records, including body part injured, diagnosis, external cause, injury intent, and a brief narrative with additional details about the injury. Cases are assigned 1 or 2 CPSC codes that designate what products or activities were involved at the time of injury.

For this study NEISS was queried for data on demographics, CPSC codes, body part(s) affected, patient disposition, and the brief narrative. Diagnosis codes were used to categorize injuries into the following groups: cold thermal injuries (e.g. isolated frostbite not due to immersion), hot thermal injuries (burns not including heat stroke), hyperthermia (from atmospheric exposure), hypothermia (from atmospheric exposure), immersion/drowning, foreign body ingestion (e.g. swallowing tackle), major trauma (amputation, organ space injury, and closed head injuries including concussions), minor trauma (lacerations, abrasions, contusions, punctures, and hook injuries), orthopedic/musculoskeletal (fractures, sprains, strains and minor musculoskeletal injuries), medical problems (general medical conditions that happened to occur while fishing), and bites/skin infections (e.g. insect bites and delayed infections after hook injuries). Additional data was then abstracted from the brief narrative in duplicate (CAT and JMA). NEISS narratives generally describe how the injury occurred but are highly variable in length and content. To minimize variability of the data collected only targeted information was obtained. The narratives were used to identify injuries that occurred while ice-fishing, mechanism of injury, intoxication data, and additional detail regarding the diagnosis to aid in categorization.

Descriptive statistical analysis was performed using JMP software version 10.0.0 (SAS Institute, Inc). Comparison between ice fishing and non-ice fishing demographic, injury patterns, and outcomes was assessed using student t test (2-tailed), Mann–Whitney U test, and Fisher exact test as indicated with a p value <.05 being significant.

3. Results

Between 2009 and 2014, we identified n = 8220 patients who sustained fishing related injuries, of which n = 85 (1.03%) were related to ice fishing. The percent of fishing injuries due to ice-fishing increased slightly over the course of the study (0.52% in 2009 to 1.09% in 2014, $R^2 = 0.31$) (Fig. 1). January was the most common month for ice fishing injuries (38.8% of ice-fishing injuries); all ice fishing injuries occurred between November and April. When compared to traditional fishing, patients that presented with injuries were similar in age (36.6 ± 25.1 years traditional fishing vs ice fishing 39.4 ± 17.5, P = .31). The majority of both ice-fishing related patients (88.2%) and traditional fishing patients (80.4%) were men (P = .07). Patients injured while ice-fishing were more likely to be Caucasian (74.1%) compared to traditional fishing (58.7%, P = .034). When comparing ice fishing to traditional fishing the type of injuries varied significantly between groups (Table).

The most common ice-fishing related injuries were orthopedic/musculoskeletal (45.9%, n = 39) followed by minor trauma (36.5%, n = 31), major trauma (5.9%, n = 5), and immersion/drowning (4.7%, n = 4). Immersion/drowning injuries occurred in December (n = 2) and March (n = 2). Interestingly, hot thermal injuries were tied for the fourth most common injury type (4.7%, n = 4) and cold thermal injuries (1.2%, n = 1) and hypothermia (0%, n = 0) were rarely reported. Ice-fishing injured patients were more likely to have torso (P < .001) and >50% body area injuries (P = .01) while traditional fishing injuries were more likely to be upper extremity injuries (p = <0.001, Fig. 2). The majority of ice-fishing injuries occurred on public/recreational land (89.4%) and the remainder occurred on home or farm property (10.6%). Although intoxication was rarely reported in the case narratives it was reported twice as often in the narrative of ice-fishing injuries (1.2%) compared to traditional fishing (0.6%) injuries.

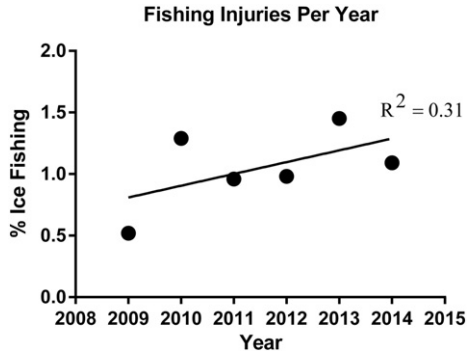

Fig. 1. Rate of ice fishing injuries of all fishing related injuries over 2009–2014 ($R^2 = 0.31$).

Outcomes also varied between ice-fishing and non-ice fishing related injuries. Although the majority of ice-fishing patients were treated and released from the emergency room (89.4%), the rate of admission/transfer was significantly higher (10.6%) than the traditional fishing patients (2.6%, P < .001). There were no ED fatalities reported in the ice-fishing group, but there were two in the traditional fishing group (P = 1.0).

4. Discussion

Data from the NEISS-AIP demonstrates that among patients that present to the ED with fishing related injuries, ice-fishing related injury patterns are more severe than their warmer weather counterparts. These injuries appear to be uniquely related to the inherent risk associated with ice-fishing. Furthermore, hot thermal burns were much more common among ice-fishermen than traditional fishermen. Given that ice-fishing has increased by 11% over the time period of 2006 to 2011 [11,12], it is important that this information be used to drive injury prevention education and determine specific injury prevention targets.

The majority of ice-fishing injuries were minor, but there were some unique injury patterns identified that warrant further investigation and discussion. Thermal injuries that occurred while ice-fishing, though somewhat counterintuitive, were likely due to the heating systems employed to keep ice-fishermen warm. These systems are often used in makeshift structures and with little regulation or oversight. Given the unique environmental setting one would suspect that hypothermia from atmospheric exposure would be a significant risk, but our data suggest that immersion related hypothermia should be an important target for future injury prevention.

A significant contributing factor toward death or accident in high sea commercial fishing industry is alcohol use and also appears to be a risk factor for immersion and death during boating and fishing [6]. It is difficult to assess the extent to which alcohol plays a role among ice-fishing related injuries in this study given the data limitations of the NEISS database. However, intoxication was reported twice as often in the narrative of ice-fishing injuries compared to traditional fishing injuries warranting further investigation. Unfortunately, there is no literature or case series for which to compare our results, as the majority of data is on individual injury locations in non-ice fishing such as ocular and hook related injuries [2,4,13,14], is epidemiologically based [6], or is aimed at studying commercial fishing [1,15]. The available literature