Thin Ice

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Learning Objectives:

1) Understand cold physiology as it relates to sudden ice water immersion.
2) Identify the dangers of activities that take place on ice.
3) Understand safety procedures that will minimize the possibility of falling through ice.
4) Understand what to do as either a victim or witness of a cold water immersion incident.

Many winter activities involve transportation over ice covered bodies of water. These include cross country skiing, skating, snowmobiling, ice fishing, driving etc. Ice conditions are difficult to evaluate and can change dramatically making it difficult to ever completely guarantee safe passage on ice. Therefore, the public are often admonished to stay off the ice at all times. However, this may not be realistic advice since some people will go on ice regardless. The following advice may be more practical and universally accepted.

Stay Off the Ice: or Prepare to Go Through

"An ounce of prevention is worth a pound of cure." Never has this saying been more relevant than if you fall through the ice (especially if you are on a snowmobile that likely has all of your equipment. First, you are in ice water, which isn't great for your health. Second, most or all of your stuff is either 'in' the water and wet, or actually lost underwater. What good does it do to survive the dunking and get out of the water only to give yourself the privilege of freezing to death in the snow?

The first part of preparation is understanding what might happen to you if you fall into ice water. The responses to cold water immersion can be divided into three phases which will only be briefly described here.

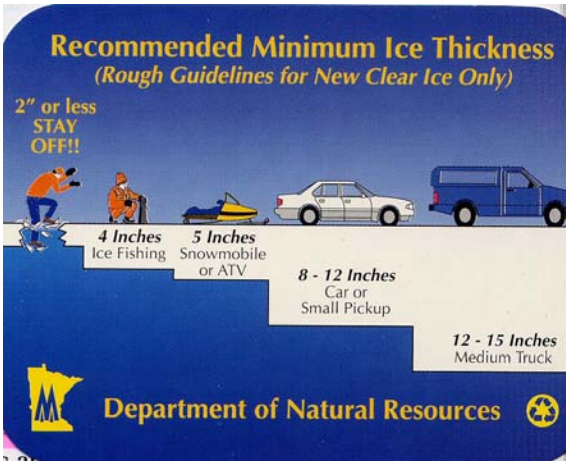
1) Cold Shock. The "Cold Shock" response occurs within the first 3-4 minutes of cold water (head-*out*) immersion and will initiate peripheral vasoconstriction, the gasp reflex, hyperventilation and tachycardia (head-*in* submersion responses will be discussed separately in Cold Water Near Drowning). These responses can respectively lead to hypocapnia, the inability to breath-hold, hypertension, and increased cardiac output, all of which can cause sudden death either immediately or within a matter of minutes after immersion (i.e., due to syncope or convulsions leading to drowning, vagal arrest of the heart, and ventricular fibrillation) in susceptible individuals.

2) Cold Incapacitation. For those surviving the cold shock response, significant cooling of peripheral tissues, especially in the extremities, continues to occur for the first 30 minutes of immersion. This cooling has a direct deleterious effect on neuromuscular activity. This effect is especially significant in the hands where blood circulation is negligible, leading to finger stiffness, poor coordination of gross and fine motor activity, and loss of power. It has been shown that this effect is primarily due to peripheral and not central cooling. The loss of motor control makes it difficult, if not impossible, to execute survival procedures such as grasping a rescue line or hoist, signaling, etc. Thus the ultimate cause of death is drowning either through a failure to initiate or maintain survival performance (i.e., keeping afloat, swimming, grasping onto a life-raft etc.) or excessive inhalation of water under turbulent conditions.

3) Long term hypothermia. The individual who survives the immediate and short term phases of cold water immersion faces the possible onset of hypothermia as continuous heat loss from the body eventually decreases core temperature. Many predictive models have been developed to determine the core temperature response to cooling that are based on relationships between body composition, thermoregulatory response (i.e., shivering heat production), clothing/insulation, as well as water temperature and sea conditions. All of these factors have been taken into account in a recent "Survival Time" prediction model which now used to assist in search time decisions by various search and rescue teams.

Secondly, consider the following ice condition and equipment issues:

1) Ice Conditions. You should take time to find out about the ice conditions and whether the ice can hold you while you undertake your specific activity. You may ask the locals or you might drill your own test holes. You should also understand the affects of seasonal differences, as well as hidden currents, on ice thickness and strength. In general, stay off the ice if it is less than 3" (7 cm) thick. Use the following graphic from the State of Minnesota, Dept. of Natural Resources as a guide.



2) Flotation snowmobile suit. Absolutely the best thing you could buy if you ever plan to snowmobile on frozen lakes, rivers etc. Cold water rapidly disables you and if you end up in open water your chances aren't good with a normal suit. You probably won't be able to stay afloat more than 10 minutes. A flotation suit may cost a few hundred dollars more, but your life is worth it, isn't it?

3) Fire starter. If you get out of the water you must be able to start a fire. Fire provides warmth, dry clothes, psychological support and an excellent signal. If you can't light a fire you'll

spend a very uncomfortable night at best, or freeze to death at worst. Lighters and waterproof matches are fine but you need a bomb-proof system in you suit pocket. This can take the form of a flint stick, a striker and cotton balls (they must be real cotton) saturated with Vasoline. Tease out some strands from the cotton ball and strike some sparks onto it and voila, you have a guaranteed fire that will burn for a few minutes and give you ample time to get your kindling ablaze.

4) Daypack with emergency gear. You should have some minimal emergency gear packed in a daypack. This could include some shelter, food, water and more fire starter (did I say it was important to be able to light a fire?). Remember the most important thing. If you are snowmobiling remember, anytime you are on the ice, you should be WEARING YOUR PACK. That way if you loose your sled, you've got some basic equipment for survival.

5) Throwbag (50') (applies to snomobiling). Every snowmobile should have a throwbag with at least 50' of rope (a boating throwbag will do fine). Whoever does not drive his/her sled into the water can then take out their rope and save the lives of those in the water. It is very difficult to hold on to the loose end of a rope if your hands are freezing. Remember to tie a loop at the end of the rope so the victim can place their bent arm through the loop or put the loop under their arms.

The final way to "prepare to go through" is by considering what to do if preparation fails and you do take a cold dip.

1) Don't panic. Remember that you will not become, or die of hypothermia, within minutes. Don't panic and concentrate on controlling your breathing.
2) Position yourself. Move around the hole in the ice toward the strongest part of the ice. This will usually be where you fell in as this was supporting your weight before you fell through.

3) Get out. Put your arms up on the ice and kick your feet to bring your body to a horizontal position at the water surface. Keep kicking and pull yourself along the ice.

4) Don't blow it. Once you are out, do not stand up. Rather roll away from the hole and then crawl to be sure your on solid ice before you stand up.