

Hypothermia Prevention, Recognition and Treatment. Articles, Protocols and Research on Life-saving skills.

The recommended treatment of hypothermia in the field is core rewarming to prevent post-rescue collapse.

Cold Injuries & Cold Water Near Drowning Guidelines (Rev 01/96)

STATE OF ALASKA COLD INJURIES AND COLD WATER NEAR DROWNING GUIDELINES (Rev 01/96)

Table of Contents

Select a text link to go directly to that section of this publication

- [Introduction](#)
 - [Hypothermia: General Points](#)
 - [Hypothermia: General Public](#)
 - [Hypothermia: First Responder/Emergency Medical Technician I](#)
 - [Hypothermia: Emergency Medical Technician II](#)
 - [Hypothermia: Emergency Medical Technician III/Paramedic](#)
 - [Hypothermia: Small/Bush Clinic](#)
 - [Hypothermia: Hospital](#)
 - [Cold Water Near Drowning: General Points](#)
 - [Cold Water Near Drowning: General Public](#)
 - [Cold Water Near Drowning: First Responder/Emergency Medical Technician I](#)
 - [Cold Water Near Drowning: Emergency Medical Technician II](#)
 - [Cold Water Near Drowning: Emergency Medical Technician III](#)
 - [Cold Water Near Drowning: Paramedic](#)
 - [Cold Water Near Drowning: Small/Bush Clinic](#)
 - [Cold Water Near Drowning: Hospital](#)
 - [Frostbite: Introduction](#)
 - [Frostbite: General Points](#)
 - [Frostbite: References](#)
 - [Alaska 24 Hour Emergency Departments](#)
 - [Temperature Conversions](#)
 - [Frostbite: Evaluation and Treatment](#)
 - [Acknowledgements](#)
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INTRODUCTION

These guidelines have been developed for use by pre-hospital , clinic and hospital personnel dealing with cold problems in Alaska. They are meant to be guidelines, not absolute rules, governing the treatment of hypothermia and cold water near drowning.

Field personnel, from first responders through paramedics, may not want to carry the full set of guidelines with them. It may be more practical simply to carry the portion pertinent to their level of training, and to be generally familiar with the content for their level.

The full set of guidelines probably would be best utilized in hospital radio rooms, where calls come in from pre-hospital

personnel with various levels of training.

To illustrate:

If a call comes in to Dillingham hospital from Naknek about a hypothermic patient, the hospital personnel need to ask the level of training of the pre-hospital personnel. If the caller is an EMT-II, for example, the hospital personnel can then turn to Hypothermia-EMT-II and direct the EMT in appropriate treatment.

Readers should note that these protocols are primarily designed to be used in EMS education and as a reference for the treatment of cold injuries and for use in assisting in the development of local standing orders. In the absence of standing orders, they may be used to guide the treatment of cold injuries until communication with a physician is established.

These guidelines are not intended to serve as a comprehensive teaching document on cold related illnesses and injuries. Consequently, those teaching the treatment of cold injuries must be prepared to elaborate on pathophysiology and treatment.

HYPOTHERMIA:

GENERAL POINTS

A.

The evaluation and treatment of hypothermia whether wet or dry, on land or water, are similar. Specific differences are covered in the following pages.

B.

In the cold patient, a rectal temperature is one of the vital signs. In terms of the ABC's, think:
A - Airway B - Breathing C - Circulation D - Degrees

C.

In the cold patient, body core temperature becomes an important sign. While obtaining a body core temperature is important and useful for assessing and treating hypothermia, there is tremendous variability in individual physiologic responses at specific temperatures and a low reading thermometer may not always be available. Therefore, these guidelines are not solely based on the patient's measured temperature.

D.

Assessment of temperature:

1. The simplest assessment of a patient's body temperature may be performed by placing an un-gloved hand against the skin of the patient's back or chest. If the skin feels warm, hypothermia is unlikely. This method, however, does not provide a reliable estimate of the patient's core temperature.
2. Axillary and oral measurements are poor measures of core temperature. Rectal temperatures more closely approximate the core temperature and are a practical method for use in the field. It is acknowledged that other methods of estimating the core temperature exist. Use of techniques other than rectal measurements should be evaluated for their accuracy and practicality in the field. The decision to use a methodology other than rectal temperatures should be made in consultation with the service's physician medical director.
3. Patients with cold skin should have a rectal temperature taken with a low reading thermometer. Household thermometers are useless in this setting. Low reading rectal thermometers should be capable of measuring temperatures as low as 70°F.
4. CAUTION: Electronic thermometers may not be accurate if they are left in the cold.

E:

The hypothermic patient should be assessed carefully for coexisting injuries and illnesses. The signs and symptoms of hypothermia may be mimicked by alcohol, diabetes, altitude sickness, overdose and other conditions. As a result, a thorough assessment of the patient is imperative. Associated significant illness or injury may exacerbate hypothermia. Splinting should be performed, when indicated, with caution to prevent additional

injuries to frostbitten tissues.

F.

Ensure that items, oxygen, and fluids (both oral and IV) coming into contact with the patient, are warmed.

G.

Since cold skin is easily injured, avoid direct application of hot objects or excessive pressure (e.g. un-insulated hot water bottles, tourniquets).

H.

As in any resuscitation, a positive attitude is important. The hypothermic patient may appear to be beyond help because of skin color, pupil dilation, and depressed vital signs. However, patients suffering from severe hypothermia have been resuscitated. Therefore, be cautious about assuming the patient cannot be resuscitated. It is also wise to be cautious about what you say during the resuscitation. Seemingly unconscious patients frequently remember what is said and done.

I.

Severe cold injuries are encountered relatively infrequently. Consequently, it is necessary that you pre-plan the management of these conditions and that you are familiar with the appropriate equipment.

J.

The inside of the ambulance and any rooms where hypothermia patients are treated should be warm enough to prevent further heat loss, ideally above 80° F (26.7° C).

K.

CPR has no significant effect on survival of the hypothermic patient in the following situations, and, in accordance with state law and local standing orders, CPR should not be initiated when:

1. Cold water submersion patients who have been under the water for more than 1 hour.
2. Hypothermia patients with a core temperature of less than 60° F (15.5° C).
3. Obvious fatal injuries, e.g. decapitation.
4. Frozen patients, e.g. ice formation in the airway.
5. The chest wall is so stiff that compression is impossible.
6. Rescuers are exhausted or at danger.

L.

Recent legislation (1994 HB 39) has empowered EMTs, paramedics and physicians-assistants to declare death in the field following 30 minutes of properly performed advanced life support, even when the patient is hypothermic. It is recommended in these cases, however, that resuscitations be continued for at least 60 minutes and be combined with the rewarming techniques found in these guidelines before being terminated. Please note that this legislation does not authorize Emergency Trauma Technicians and the general public to pronounce a patient dead.

M.

The patient with severe hypothermia must be handled very gently. The cold heart is very prone to cardiac arrest. Even cautious movement of the patient may induce cardiac arrest.

N.

The indications for the pneumatic anti-shock garments are the same as for normothermic patients. The use of the PASG is controversial and they should be used in accordance with established local protocols.

O.

The pulse should be checked for up to 45 seconds when assessing a hypothermic patient or a patient who has been removed from cold water.

HYPOTHERMIA:

GENERAL PUBLIC

A.

Assessment of Patient

Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:

- a. Temperature of 90° F (32.2° C) or less.
- b. Depressed vital signs, such as a slow pulse and/or slow respiration.
- c. Altered level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
- d. No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)

Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B.

Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapour barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Activate the emergency medical services system to provide transport to a medical facility.
3. Do not give alcohol.

C.

Treatment for Mild Hypothermia

Treat the patient as outlined in Section B.

If there is no way to get to a medical facility, rewarm the patient gradually by:

- a. Placing patient in as warm an environment as possible.
- b. Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
- c. Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
- d. Considering warm showers and warm bath if the patient is alert.
- e. Placing patient in a sleeping bag and providing contact with a warm body. The patient should not be placed a sleeping bag with another individual who is hypothermic. This method should be considered a last resort since it may endanger the rescuer and is less efficient than other methods.

Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

D.

Treatment for Severe Hypothermia with Signs of Life (e.g. Pulse and Respirations Present)

Treat the patient as outlined in sections B and C above with the following exceptions:

- a. Do not put severely hypothermic patients in a shower or bath.
- b. Do not give a patient oral fluids unless he or she is capable of swallowing and protecting his or her airway.

Treat patients who are hypothermic very gently (do not rub or manipulate extremities).

E.

Treatment for Severe Hypothermia with No Life Signs

1. Treat as above.
2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K, start CPR.
3. Use mouth-to-mask breathing.
4. Reassess the patient's physical status periodically.

Transfer to a medical facility as soon as possible.

HYPOTHERMIA:

FIRST RESPONDER/EMERGENCY MEDICAL TECHNICIAN I

A.

Assessment of Patient

Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:

- a. Temperature of 90° F (32.2° C) or less.
- b. Depressed vital signs, such as a slow pulse and/or slow respiration.
- c. Altered level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
- d. No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)

Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B.

Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapour barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Treat and transport to a medical facility.
3. Do not give alcohol.
4. When administered, oxygen should be heated to 105° - 108° F (40.5° - 42.2° C), measured at the mouth, and humidified, if possible.
5. Splinting should be performed, when indicated, with caution to prevent additional injuries to frostbitten tissues.

C.

Treatment for Mild Hypothermia

Treat the patient as outlined in Section B.

If there is no way to get to a medical facility, rewarm the patient gradually by:

- a. Placing patient in as warm an environment as possible.
- b. Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
- c. Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
- d. Considering warm showers and warm bath if the patient is alert.
- e. Placing patient in a sleeping bag and providing contact with a warm body. The patient should not be placed a sleeping bag with another individual who is hypothermic. This method, however, should be considered a last resort, however, since it may endanger the rescuer and is less efficient than other methods.

Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

D.

Treatment for Severe Hypothermia with Signs of Life. (i.e. Pulse and Respirations Present):

Obtain a core temperature (rectal).

Treat the patient as outlined in sections B and C above with the following exceptions:

- a. Do not put severely hypothermic patients in a shower or bath.
- b. Do not give a patient oral fluids unless he or she is capable of swallowing and protecting his or her airway.

Treat patients who are hypothermic very gently (do not rub or manipulate extremities).

Transport patient to a medical facility as soon as possible.

Reassess the patient's physical status periodically.

E.

Treatment for Severe Hypothermia with No Life Signs:

1. Treat as above.
2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K, start CPR.
3. Use mouth-to-mask breathing.
4. Advanced airway devices: The indications and contraindications for advanced airway devices are the same in both the hypothermic and the warm patient. However, hypothermic patients may be more difficult to intubate, precipitation of ventricular fibrillation may be a danger, and intubation should only be attempted under optimum conditions by skilled personnel only if the airway is inadequate.
5. If the rescuers are authorized to use an automated external defibrillator and the device states that shocks are indicated, one set of three stacked shocks should be delivered. If the core temperature of the patient cannot be determined or is above 86° F, treat the patient as if normothermic. If the patient's core temperature is below 86° F, discontinue use of the AED after the initial three shocks.
6. If resuscitation has been provided in conjunction with rewarming techniques for more than 60 minutes without the return of spontaneous pulse or respiration, contact the base physician for recommendations. If contact with a physician is not possible, Emergency Medical Technicians may consider terminating the resuscitation in accordance with HB 39 and local protocols.

HYPOTHERMIA:

EMERGENCY MEDICAL TECHNICIAN II

A.

Assessment of Patient

1. Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:
 - a. Temperature of 90° F (32.2° C) or less.
 - b. Depressed vital signs, such as a slow pulse and/or slow respiration.
 - c. Alternate level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
 - d. No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)
1. Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B.

Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapour barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Treat and transport to a medical facility.
3. Do not give alcohol.
4. When administered, oxygen should be heated to 105° - 108° F (40.5° - 42.2° C), measured at the mouth, and humidified, if possible.
5. Splinting should be performed, when indicated, with caution to prevent additional injuries to frostbitten tissues.
6. Do not give coffee or alcohol.
7. I.V. Therapy
 - a. Indications for I.V.'s are the same for mildly hypothermic patients as they are for normothermic patients.
 - b. Most hypothermic patients are dehydrated and may require aggressive fluid resuscitation.
 - c. Do not delay transport, communications, or other therapy by taking a long time to start an I.V. I.V.'s are difficult to start in cold patients.
 - d. The recommended fluid for re-hydration is a balanced salt solution, such as normal saline or ringer's lactate.
 - e. I.V.'s should be heated to 104° - 108° F (40° - 42° C), when possible.

Medications:

- a. Indications for medications are the same for mildly hypothermic patients as they are for normothermic patients.
- b. Medications are inefficient and poorly metabolized in the hypothermic patient. In addition, due to delayed metabolism, medications given in normal therapeutic doses to severely hypothermic patients can result in toxicity when the patient is rewarmed.
- c. As with any person with altered consciousness, Narcan and 50% dextrose should be considered when there is a reasonable suspicion that their use is warranted.
- d. Sodium bicarbonate is not to be used unless specifically ordered by a physician.

C.

Treatment for Mild Hypothermia

1. Treat the patient as outlined in Section B

2. If there is no way to get to a medical facility, rewarm the patient gradually by:
 - a. Placing patient in as warm an environment as possible.
 - b. Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
 - c. Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
 - d. Considering warm showers and warm bath if the patient is alert.
 - e. Placing patient in a sleeping bag and providing contact with a warm body. The patient should not be placed a sleeping bag with another individual who is hypothermic. This method, however, should be considered a last resort, however, since it may endanger the rescuer and is less efficient than other methods.
1. Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

D.

Treatment for Severe Hypothermia with Signs of Life (e.g. Pulse and Respirations Present):

1. Obtain a core temperature (rectal).
2. Treat the patient as outlined in sections B and C above with the following exceptions:
 - a. Do not put severely hypothermic patients in a shower or bath.
 - b. Do not give a patient oral fluids unless he or she is capable of swallowing and protecting his or her airway.
1. Treat patients who are hypothermic very gently (do not rub or manipulate extremities).
2. Administer 10 cc/kilogram of a balanced salt solution as a bolus followed by 5 cc/kg/hr as a continuous infusion.
3. Transport patient to a medical facility as soon as possible.
4. Reassess the patient's physical status periodically.

E.

Treatment for Severe Hypothermia with No Life Signs:

1. Treat as above.
2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K on page 2, start CPR.
3. Use mouth-to-mask breathing.
4. Advanced airway devices: The indications and contraindications for advanced airway devices are the same in both the hypothermic and the warm patient. However, hypothermic patients may be more difficult to intubate, precipitation of ventricular fibrillation may be a danger, and intubation should only be attempted under optimum conditions by skilled personnel only if the airway is inadequate.
5. If the rescuers are authorized to use an automated external defibrillator and the device states that shocks are indicated, one set of three stacked shocks should be delivered. If the core temperature of the patient cannot be determined or is above 86° F, treat the patient as if normothermic. If the patient's core temperature is below 86° F, discontinue use of the AED after the initial three shocks.
6. If resuscitation has been provided in conjunction with rewarming techniques for more than 60 minutes without the return of spontaneous pulse or respiration, contact the base physician for recommendations. If contact with a physician is not possible, Emergency Medical Technicians may consider terminating the resuscitation in accordance with HB 39 and local protocols.

HYPOTHERMIA:

EMERGENCY MEDICAL TECHNICIAN III/PARAMEDIC

A.

Assessment of Patient

1. Severe Hypothermia: If the patient is cold and has any of the following signs or symptoms, he is considered to have severe hypothermia:

- Temperature of 90° F (32.2° C) or less.
- Depressed vital signs, such as a slow pulse and/or slow respiration.
- Altered level of consciousness, including slurred speech, staggering gait, decreased mental skills, or the lack of response to verbal or painful stimuli.
- No shivering in spite of being very cold. (Note: This sign is potentially unreliable and may be altered by alcohol intoxication.)

1. Mild Hypothermia: If the patient is cold and does not have any of these signs or symptoms, he is considered to have mild hypothermia.

B.

Basic Treatment for Hypothermia

1. Prevent further heat loss. Insulate from the ground, protect from the wind, eliminate evaporative heat loss by removing wet clothing or by covering the patient with a vapor barrier (such as a plastic garbage bag), cover the head and neck and move the patient to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through respirations.
2. Treat and transport to a medical facility.
3. Do not give alcohol.
4. When administered, oxygen should be heated to 105° - 108° F (40.5° - 42.2° C), measured at the mouth, and humidified, if possible.
5. Splinting should be performed, when indicated, with caution to prevent additional injuries to frostbitten tissues.
6. 6. I.V. Therapy

- Indications for I.V.'s are the same for mildly hypothermic patients as they are for normothermic patients.
- Most hypothermic patients are dehydrated and may require aggressive fluid resuscitation.
- Do not delay transport, communications, or other therapy by taking a long time to start an I.V. I.V.'s are difficult to start in cold patients.
- The recommended fluid for re-hydration is a balanced salt solution, such as normal saline or ringer's lactate.
- I.V.'s should be heated to 104° - 108° F (40° - 42° C), when possible.

1. Medications:

- a. Indications for medications are the same for mildly hypothermic patients as they are for normothermic patients.
- b. Medications are inefficient and poorly metabolized in the hypothermic patient. In addition, due to delayed metabolism, medications given in normal therapeutic doses to severely hypothermic patients can result in toxicity when the patient is rewarmed.
- As with any person with altered consciousness, Narcan and 50% dextrose should be considered when there is a reasonable suspicion that their use is warranted.
- Sodium bicarbonate is not to be used unless specifically ordered by a physician.

C.

Treatment for Mild Hypothermia

1. Treat the patient as outlined in Section B.

2. If there is no way to get to a medical facility, rewarm the patient gradually by:

- Placing patient in as warm an environment as possible.
 - Increasing heat production through exercise and calorie/fluid replacement. This method of adding heat is particularly important when emergency care is not readily available as in remote or prolonged transport environment.
 - Rewarming passively through the application of insulated heat packs to high heat transfer/loss areas such as the head, neck, underarms, sides of the chest wall, and groin, and heavy insulation to prevent further heat loss.
 - Considering warm showers and warm bath if the patient is alert.
 - Placing patient in a sleeping bag and providing contact with a warm body. The patient should not be placed a sleeping bag with another individual who is hypothermic. This method, however, should be considered a last resort, however, since it may endanger the rescuer and is less efficient than other methods.
1. Encourage the patient to drink warm fluids as soon as he, or she, is capable of swallowing and protecting his or her airway.

D.

Treatment for Severe Hypothermia with Signs of Life (i.e. Pulse and Respiration Present):

1. Obtain a core temperature (rectal).
2. Treat the patient as outlined in sections B and C above with the following exceptions:

- Do not put severely hypothermic patients in a shower or bath.
- Do not give a patient oral fluids unless he or she is capable of swallowing and protecting his or her airway.

1. Treat patients who are hypothermic very gently (do not rub or manipulate extremities).
2. Administer 10 cc/kilogram of a balanced salt solution as a bolus followed by 5 cc/kg/hr as a continuous infusion.
3. Transport patient to a medical facility as soon as possible.
4. Reassess the patient's physical status periodically.

E.

Treatment for Severe Hypothermia with No Life Signs (CPR Required)

1. Treat as above.
2. If no pulse (after checking for up to 45 seconds) and no respirations and no contraindications as listed in section K on page 2, start CPR.
3. Use mouth-to-mask breathing.
4. Advanced airway devices: The indications and contraindications for advanced airway devices are the same in both the hypothermic and the warm patient. However, hypothermic patients may be more difficult to intubate, precipitation of ventricular fibrillation may be a danger, and intubation should only be attempted under optimum conditions by skilled personnel only if the airway is inadequate.
5. Guidelines have not been established for the use of advanced cardiac life support procedures in the hypothermic patient. One series of defibrillation attempts if the patient is in ventricular fibrillation (200 ws, 300 ws, 360 ws, OR 200 ws, 200 ws, 360 ws) is reasonable followed by a bolus of bretylium/lidocaine. If successful the patient should be transported immediately to the nearest medical facility. If unsuccessful and the patient's core temperature is below 86° F, the patient should immediately be transported to the nearest medical facility without further attempts at defibrillation. If the temperature is above 86° F, continue with resuscitation as if the patient was normothermic. Additional treatment should be determined by the medical director.
Note: Shivering can mimic ventricular fibrillation.
6. If the cardiac rhythm is asystole, as assessed in two different leads, do not attempt defibrillation. Additional ACLS medications should be used with caution in accordance with physician signed standing orders and as stated in B--7 of this section.
7. If resuscitation has been provided in conjunction with rewarming techniques for more than 60 minutes without the return of spontaneous pulse or respiration, contact the base physician for recommendations.

If contact with a physician is not possible, Emergency Medical Technicians may consider terminating the resuscitation in accordance with HB 39 and local protocols.

HYPOTHERMIA:

SMALL/BUSH CLINIC

- A. The extent of the evaluation and treatment in small/bush clinics is defined by the training of the personnel and the available equipment as outlined in the foregoing guidelines.
- B. For transfer to a higher medical facility, the patient must be stabilized in the clinic rather than transferred as an unstable patient. If the patient is requiring CPR or is otherwise with unstable vital signs, then the necessary equipment and trained personnel-if not already at the clinic-should be sent to the clinic in order to stabilize the patient for transfer to a higher medical facility.
- C. Once the rewarming process has started in the clinic, it should be continued until transfer is possible and appropriate or the patient recovers.
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HYPOTHERMIA:

HOSPITAL

- A. General Points
1. Treat to the level of your ability as your hospital equipment, staff, and skills dictate.
 2. All patients should be stabilized before any transport to another facility. The patient should be kept in the sending hospital until the patient is stable or accepted by the receiving hospital.
- B. Evaluation
1. Initial attention to the ABCs and CPR as needed.
 2. Vital signs, including rectal temperature.
 3. Brief history.
 4. Brief physical exam:
 - a. Feel for skin temperature.
 - b. Level of consciousness and neurological examination.
 - c. Cadiopulmonary exam.
 - d. Associated trauma.
 - e. Weight.
 1. Suggested laboratory and x-ray evaluation, depending on available staffing and equipment:
 - a. Chest x-ray.
 - b. 12 lead electrocardiogram.
 - c. Urine: urinalysis, sodium and osmolality.
 - d. Blood: CBC, BUN, creatinine, electrolytes, sugar, platelets, PTT, prothrombin time, liver function tests, amylase.

- e. Arterial blood gases.

C.

Monitoring and Treatment

1. Basic treatment is the same as that indicated for pre-hospital personnel in these guidelines.
2. Physiologic monitoring. Pulse oximetry or transcutaneous oxygen monitoring may be unreliable due to peripheral vasoconstriction. Consider topical methyl salicylate as a skin vasodilator. All patients should be on a cardiac monitor.
3. Administer 10 cc/kilogram of a crystalloid solution (5% dextrose in normal saline) as a bolus followed by 5 cc/kg/hr as a continuous infusion. Large amounts of fluid may be necessary for complete fluid resuscitation. A CVP line may help to determine fluid status. I.V.'s should be heated to 104° - 108° F (40° - 42° C), when possible.
4. Urinary bladder catheter, preferably with a thermistor.
5. Nasogastric tube or orogastric tube, if the patient is unconscious and intubated.
6. Endotracheal/Nasotracheal tube is indicated in the unconscious patient after careful neck evaluation.
7. Ventilate with moist air or oxygen heated to 105° - 108° F (40.5° - 42.2° C), measured at the mouth, and humidified, if possible.
8. Continue monitoring until stable and warm.

D.

Adding Heat

1. The recommended possibilities include:

EXTERNAL METHODS	INTERNAL METHODS
Gradual Spontaneous Rewarming	Warm Steam Inhalation/Ventilation (105° - 108° F) = (40.5° - 42.2° C)
Warming Blankets	Peritoneal Lavage (105° - 110° F) = (40.5° - 43.3° C)
Tub Bath (Up to 100° F (37.7°C))	Extracorporeal Circulation
	Warm Gastric/Bladder Lavage (105° - 110° F) = (40.5° - 43.3° C)
	Warm IV's (104° - 108° F) = (40° - 42° C)
	Chest Lavage via Chest Tubes

2. Regardless of the method chosen for adding heat, the patient must be under total physiologic control and the temperatures of devices, fluids, and gasses used for rewarming should be monitored.
3. Tub bath is one of the most rapid rewarming methods and requires immediate laboratory results and extremely close physiological monitoring.
4. For Severe Hypothermia without Signs of Life: Warm the core as rapidly as possible, using one or more of the internal methods, preferably cardiopulmonary bypass, if available.
5. For Severe Hypothermia with Life Signs: Use the rewarming method available in the facility which is most familiar to you.

E.

Most Common Problems

1. Arrhythmias:

- a. Arrhythmias other than ventricular fibrillation will usually convert spontaneously with rewarming. If treatment is not working, continue rewarming.
 - b. In ventricular fibrillation with a core temperature of less than 85° F, consider one attempt at defibrillation (200 ws, 300 ws, 360 ws OR 200 ws, 200 ws, 360 ws) and intravenous bretylium/lidocaine.
1. Dehydration: Monitor and treat accordingly.
 2. Hyperkalemia: Monitor and treat accordingly. (Do not infuse potassium in I.V.'s until serum potassium is obtained.)
 3. Hyperglycemia and hypoglycemia: Monitor and treat accordingly.
 4. Arterial Blood Gasses: Monitor and treat accordingly.

F.

Transferring Patients to Tertiary Care Facilities

1. The general indications to transfer the patient from a smaller hospital to a tertiary care facility are:

- a. Lack of nursing and support staff.
- b. Lack of equipment to properly provide for a critically ill patient.

1. Specifically, the patient should be transferred if there is:

- a. no capability for continuous arterial blood gas monitoring;
- b. profound neurological depression;
- c. associated significant trauma; or
- d. associated significant frostbite.

1. The patient should not be transferred until he or she has been accepted by the receiving medical facility and has been stabilized as much as possible to ensure safe transport.

COLD WATER NEAR DROWNING:

GENERAL POINTS

A.

For the purposes of this document, cold water is defined as being less than 70° F (21.1° C).

B.

Anyone submerged long enough to be unconscious should be transported to the hospital, even if they he or she has regained consciousness.

C.

If the person has been under water for LESS than one hour, full resuscitative efforts should employed. If the person has been under water for MORE than one hour, resuscitation efforts are usually unsuccessful.

D.

Recent legislation (1994 HB 39) has empowered EMTs, paramedics and physicians-assistants to declare death in the field following 30 minutes of properly performed advanced life support, even when the patient is hypothermic. It is recommended in these cases, however, that resuscitations be continued for at least 60 minutes and be combined with the rewarming techniques found in these guidelines before being terminated. Please note that this legislation does not authorize Emergency Trauma Technicians and the general public to pronounce a patient dead.

E.

If it is not known how long the person has been under water, you should consider him/her to have been under water less than one hour.

F.

There is no difference between fresh and salt water near drowning regarding outcome or treatment.

- G. If it does not delay rescue, maintain the patient's body in a horizontal position while removing him/her from the water.
- H. These principles apply to any near drowning, not just those in cold water. The difference between warm and cold water is that in submersions greater than 6 minutes, the chance for survival in warm water is much less than in cold water. The colder the water, the better the chance for survival.
- I. Because hypothermia is rarely profound (below 85° F (29.4° C) in cold water near drowning, the hypothermia aspect of the problem is less critical than the pulmonary or coagulation aspects. Thus, rewarming is done very cautiously and gradually, without the need for invasive techniques such as peritoneal lavage or AV shunts.
- J. Many near drowning patients die of a particular type of disseminated intravascular coagulation, not from their pulmonary problems.
- K. Persons surviving an immersion episode should be transported to the nearest medical facility for further evaluation. Accumulation of fluid in the lungs (noncardiogenic pulmonary edema) may develop 6 - 24 hours after submersion.
-

COLD WATER NEAR DROWNING:

GENERAL PUBLIC

Evaluation and Treatment

1. The Heimlich Manoeuvre should be used only when a foreign body airway obstruction is suspected.
 2. CPR must be started immediately when the patient is determined to be pulse less, check pulse of up to 45 seconds.
 3. Assess carefully for associated injuries.
 4. Follow the General Public section on hypothermia for additional therapy as needed.
-

COLD WATER NEAR DROWNING:

FIRST RESPONDER/EMERGENCY MEDICAL TECHNICIAN I

Evaluation and Treatment

1. The Heimlich Manoeuvre should be used only when a foreign body airway obstruction is suspected.
 2. CPR must be started immediately when the patient is determined to be pulse less after a check pulse of up to 45 seconds.
 3. Assess carefully for associated injuries.
 4. Follow the Emergency Medical Technician I section on Hypothermia for additional therapy as needed.
-

COLD WATER NEAR DROWNING:

EMERGENCY MEDICAL TECHNICIAN II

Evaluation and Treatment

1. The Heimlich Manoeuvre should be used only when a foreign body airway obstruction is suspected.
2. CPR must be started immediately when the patient is determined to be pulse less after a pulse check of up to 45 seconds.
3. Assess carefully for associated injuries.
4. Follow the Emergency Medical Technician II section on Hypothermia for additional therapy as needed, with the following exceptions.
 - a. If the main problem is not severe hypothermia, medication should be used as in the normothermic patient.
 - b. Because hypovolemia is generally not a problem in cold water near drownings, a balanced salt solution should be infused at a 'to keep open' rate.

COLD WATER NEAR DROWNING:

EMERGENCY MEDICAL TECHNICIAN III

Evaluation and Treatment

1. The Heimlich Manoeuvre should be used only when a foreign body airway obstruction is suspected.
2. CPR must be started immediately when the patient is determined to be pulse less after a pulse check of up to 45 seconds.
3. Assess carefully for associated injuries.
4. Follow the Emergency Medical Technician III/Paramedic section on Hypothermia on page 19 (including the 45 second pulse check) for additional therapy as needed, with the following exceptions.
 - a. If the main problem is not severe hypothermia, medication should be used as in the normothermic patient.
 - b. Because hypovolemia is generally not a problem in cold water near drowning, a balanced salt solution should be infused at a 'to keep open' rate.

COLD WATER NEAR DROWNING:

PARAMEDIC

Evaluation and Treatment

1. The Heimlich Manoeuvre should be used only when a foreign body airway obstruction is suspected.
2. CPR must be started immediately when the patient is determined to be pulse less after a pulse check of up to 45 seconds.
3. Assess carefully for associated injuries.
4. Follow the Emergency Medical Technician-III/Paramedic section on Hypothermia on page 19 (including the 45 second pulse check) for additional therapy as needed, with the following exceptions.
 - a. If the main problem is not severe hypothermia, medication should be used as in the normothermic patient.
 - b. Because hypovolemia is generally not a problem in cold water near drowning, a balanced salt solution should be infused at a 'to keep open' rate.

COLD WATER NEAR DROWNING:

SMALL/BUSH CLINIC

Evaluation and Treatment

1. The extent of the evaluation and treatment in small/bush clinics is defined by the training of the personnel and the available equipment as outlined in the foregoing guidelines.
2. It is very important to clear the airway with any of the standard Manoeuvre, but no specific Manoeuvre are mandatory to expel water from the lungs. Do not do the Heimlich manoeuvre on these patients unless there is evidence of a solid foreign body airway obstruction.
3. CPR must be started immediately when the patient is determined to be pulse less after a pulse check of up to 45 seconds.
4. Assess carefully for associated injuries.
5. Follow the Small/Bush Clinic Section on Hypothermia for additional therapy as needed, with the following exceptions.
 - a. If the main problem is not severe hypothermia, medication should be used as in the normothermic patient.
 - b. Because hypovolemia is generally not a problem in cold water near drowning, a balanced salt solution should be infused at a 'to keep open' rate.

COLD WATER NEAR DROWNING:

HOSPITAL

A. Evaluation

The evaluation of the cold water near drowning patient is generally the same as indicated in the Hospital section of the hypothermia guidelines except for the laboratory evaluation, which in near drowning should be, in order:

1. Arterial blood gases.
2. Chest x-ray.
3. 12 lead electrocardiogram.
4. Electrolytes, BUN, CBC.
5. Scan the serum for pinkness (indicating hemolysis).
6. Institute cardiorespiratory monitoring.
7. I.V. therapy D5W at keep open levels. (In children, 1/4 - 1/2 maintenance rate.)

B. Therapy

1. Attention to the ABC's, with respiratory support, intubation, etc., as needed.
2. Rewarming. Active rewarming methods (warm air inhalation, external heat sources, etc.) should be used as indicated by rectal temperature.

Once circulation has been established, do only passive rewarming (light sheets or light blankets; room temperature). Note that these patients often become hyperthermic.

3. Aspiration pneumonitis and pulmonary edema may be treated with appropriate diuretics, and mechanical ventilation and oxygenation.
4. Profound neurological depression: Consider aggressive cerebral resuscitation, as per Conn3, with intraventricular pressure monitoring, diuretics, and barbiturates.

5. Hemolysis - Treat as with any patient with hemolysis.
6. Disseminated Intravascular Coagulation - Treat as with any patient with DIC.
7. Renal insufficiency - Treat as with any patient with renal insufficiency.
8. Cardiopulmonary bypass is an appropriate therapy when the patient has resistant hypoxemia and cannot be rewarmed.

C.

Transferring the Near Drowning Patient to a Tertiary Care Facility

1. First the patient should be stabilized at the nearest hospital with intubation as necessary, and ventilation.
2. The general indications to transfer the patient from a small hospital to a tertiary care facility are:
 - a. Lack of nursing and support staff.
 - b. Lack of equipment to properly provide ongoing care for a critically ill patient.
1. Specifically, the patient should be transferred if there is:
 - a. no capability for arterial oxygen monitoring..
 - b. deterioration of pulmonary status.
 - c. renal insufficiency.
 - d. hemolysis.
 - e. profound neurological depression.
 - f. significant associated trauma.

FROSTBITE:

INTRODUCTION

Frostbite is the freezing of tissue and may involve only superficial tissues or may extend to the bone. The onset and severity of frostbite may be affected by air temperature, wind speed, duration of exposure, amount of exposed area, and predisposing conditions such as:

- poor or inadequate insulation from the cold or wind;
- impaired circulation from tight clothing or shoes;
- fatigue;
- altitude;
- immersion;
- injuries;
- circulatory disease;
- poor nutrition;
- dehydration;
- hypothermia;
- alcohol or drug use; and
- tobacco products.

A discussion of the pathophysiology of frostbite is beyond the scope of this document. Simply put, damage to the frostbitten tissues is caused by crystallization of water within the tissues, typically between the cells, as well as changes in electrolyte concentration within the cells.

Frostbite is frequently seen in Alaska, although, in most circumstances, the frostbite is superficial and treated by the patient at home. Occasionally, it is severe enough to warrant transport to a medical facility for evaluation and treatment. Seldom will it be necessary for emergency medical personnel to perform in-field rewarming for deep frostbite. It may,

however, be necessary to treat patients with superficial frostbite who have sustained other injuries, (e.g. a motor vehicle crash patient who has been exposed to sub-zero temperatures while awaiting the arrival of rescue and medical personnel).

These guidelines are designed to assist pre-hospital emergency medical personnel in assessing and treating frostbite. In-hospital treatment is beyond the scope of this section and readers are encouraged to refer to "Cold Injury: A Collection of Papers by William J. Mills, M.D. and Colleagues," which appeared in the January/February/March 1993 issue of Alaska Medicine, the official journal of the Alaska State Medical Association and the American Society for Circumpolar Health.

FROSTBITE:

GENERAL POINTS

Hypothermia and other life threatening conditions may be present in the patient with frostbite and must be evaluated and treated immediately.

When caring for a patient in extremely cold temperatures, take great care to prevent hypothermia, tissues from becoming frostbitten, and already frostbitten tissues from becoming worse.

If transporting a patient with frostbite which will not be rewarmed in the field, the medical provider should protect the frostbitten parts from additional injury and temperature changes.

Superficial frostbite affects the dermis and shallow subcutaneous layers of the skin and is recognized by white or gray colored patches. The affected skin feels firm, but not hard. The skin initially turns red and, once frostbitten, is not painful. No tissue loss will occur when treated properly.

Deep frostbite affects the dermal and subdermal layers and may involve an entire digit or body part. The skin feels hard and cold and the affected tissue is white or gray. A pulse cannot be felt in the deeply frostbitten tissue and skin will not rebound when pressed.

Large blisters on the frostbitten area indicate that deep frostbite has partially thawed.

Treatment of deep frostbite is usually extremely painful and best accomplished in a medical facility. If you can get the patient to a medical facility within a reasonable amount of time, or do not have the capability to rewarm the tissues properly or cannot prevent refreezing, you should transport the patient rather than attempt to rewarm the tissue in the field. Advice should be sought from a physician by radio or telephone before electing to rewarm frostbitten tissue in the field, whenever possible.

In most circumstances, the risks posed by improper rewarming or refreezing outweigh the risks of delaying treatment for deep frostbite.

Tissue which is thawed and then refrozen almost always dies. Consequently, the decision to thaw the frostbitten tissue in the field commits the provider to a course of action which may involve pain control, maintaining warm water baths at a constant temperature, and protecting the tissue from further injury during rewarming and eventual transport. If rewarmed in the field, frostbitten extremities cannot be used for ambulation.

It is reasonable to consider rewarming the frostbitten tissue in a controlled manner if uncontrolled, spontaneous, rewarming is likely to occur during prolonged evacuation or transport.

Make plans for transporting the patient as early as circumstances allow. In some circumstances, when frostbite is not severe and is not complicated by other injuries, and there are resources available to monitor the patient's progress, a physician should be consulted. He or she may decide the patient should not be transported. This should be clearly understood and carefully documented by the pre-hospital provider.

Do not:

- rub the frozen part;
- allow the patient to have alcohol or tobacco;
- apply ice or snow;
- attempt to thaw the frostbitten part in cold water;
- attempt to thaw the frostbitten part with high temperatures such as those generated by stoves, exhaust, etc.; and
- break blisters which may form.

Frostbitten tissues should be handled extremely gently before, during, and after rewarming.

FROSTBITE:

EVALUATION AND TREATMENT

Anticipate, assess and treat the patient for hypothermia, if present.

Assess the frostbitten area carefully since the loss of sensation may cause the patient to be unaware of soft tissue injuries in that area.

Obtain a complete set of vital signs and the patient's temperature.

Obtain a patient history, including the date of the patient's last tetanus immunization.

If there is frostbite distal to a fracture, attempt to splint the fracture in a manner which does not compromise distal circulation.

Determine whether rewarming the frostbitten tissue can be accomplished in a medical facility. If it can, transport the patient while protecting the tissue from further injury from cold or impacts.

If the decision is made to rewarm frostbitten tissue in the field, you should prepare a warm water bath (approximately 100° - 106° F) in a container large enough to accommodate the frostbitten tissues without them touching the sides or bottom of the container. Advanced life support personnel should administer morphine or other analgesics in accordance with physician signed standing orders or on-line medical control if the frostbitten area is extensive and the medical providers are authorized to do so.

A source of additional warm water must be available.

Shock due to frostbite is very uncommon. However, medical personnel should always be alert for shock and begin treatment at the earliest sign it is developing. If the frostbite patient develops shock, personnel should perform a thorough examination for additional injuries.

Remove jewelry and clothing, if present, from the affected area.

If possible, consult a physician regarding the administration of oral analgesics, such as acetaminophen, ibuprofen or aspirin.

Water should be maintained at approximately 100° - 106° F and gently circulated around the frostbitten tissue until the distal tip of the frostbitten part becomes flushed.

Pain after rewarming usually indicates that tissue has been successfully rewarmed.

After re-warming, let the frostbitten tissues dry in the warm air. Do not towel dry.

After thawing, tissues that were deeply frostbitten may develop blisters or appear cyanotic. Blisters should not be broken

and must be protected from injury.

Pad between affected digits and bandage affected tissues loosely with a soft, sterile dressing.

Rewarmed extremities should be kept at a level above the heart, if possible.

Protect the rewarmed area from refreezing and other trauma during transport. A frame around the frostbitten area should be constructed to prevent blankets from pressing directly on the injured area.

Do not allow an individual who has frostbitten feet except when the life of the patient or rescuer is in danger. Once frostbitten feet are rewarmed, the patient becomes nonambulatory.

FROSTBITE:

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24 HOUR EMERGENCY DEPARTMENTS

24 Hour Emergency Departments
(All in area code 907)

For more information, contact your nearest referring medical facility or one of the following:

INTERIOR REGION

Fairbanks Memorial Hospital, Fairbanks - 452-8181

SOUTHERN REGION

Alaska Native Medical Center, Anchorage - 279-6661
Central Peninsula General Hospital, Soldotna - 224-4404
Alaska Regional Hospital - Alaska, Anchorage, - 276-1131
Providence Hospital, Anchorage - 562-2211
Valley Hospital, Palmer - 745-4813

SOUTHEAST REGION

Bartlett Memorial Hospital, Juneau - 586-2611

TEMPERATURE CONVERSIONS

Centigrade Fahrenheit

44.0	111.2
43.0	109.4
42.0	107.6
41.0	105.8
40.0	104.0
39.0	102.2
38.0	100.4
37.0	98.6
36.0	96.8
35.0	95.0
34.0	93.2
33.0	91.4
32.0	89.6
31.0	87.8
30.0	86.0
29.0	84.2
28.0	82.4
27.0	80.6
26.0	78.8
25.0	77.0
24.0	75.2
23.0	73.4

22.0	71.6
21.0	69.8
20.0	68.0
19.0	66.2
18.0	64.4
17.0	62.6
16.0	60.8
15.0	59.0
14.0	57.2
13.0	55.4
12.0	53.6
11.0	51.8
10.0	50.0

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This booklet is copyrighted by the Alaska Community Health and Emergency Medical Services Section. It may be copied in its entirety, or in part, so long as proper credit is given.

1. Community Health Aides should use the protocols for their level of EMS certification. CHAs who are not certified as EMTs should use the EMT-I protocols for cold injuries.
2. Drug therapy should be moderated because in the cold patient medications are both inefficient and poorly metabolized.
3. "Cerebral Salvage in Near Drowning following Neurological Classification by Triage," A. W. Conn, Canadian Anesthesia Society Journal, Volume 27, No. 3, May, 1980