Accidental Hypothermia

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Every year, as winter approaches, newspapers start to carry sad stories of old people dying in conditions that give grave concern to all involved in their physical, mental, social and spiritual care. Many of these deaths will be due to a condition known as hypothermia

To some nurses the knowledge that old people can die from hypothermia—the reaction of the body to an excessively cold environment—comes as a surprise. Indeed, it has been described as 'A product of the art of rediscovery, a principal characteristic of medical research.'

The aim of this short paper is to provide some background to the history of this subject together with suggestions on how this condition may be diagnosed and treated.

What is Hypothermia?

A simple interpretation of the word hypothermia is 'low temperature'. It is a condition in which the normal body temperature of 97-99°F. ceases to be maintained. The temperature of the body drops as low as 85°F. or even lower. Death follows in untreated cases and in many others severe chest conditions complicate and delay recovery to a considerable extent.

The History of Hypothermia

To understand more fully the work already undertaken on this subject, it is important to study a little of its history. The first serious recorded work appeared in 1798, written by James Currie. During this period the good effects of cold water were recommended far and wide with the result that people of all classes and positions were ducked in cold water brine for every conceivable complaint. Currie, however, investigated the causes of death of shipwrecked sailors in the River Mersey. During his experiments he immersed volunteers in water at 48°F. and took observations of both oral temperatures and pulse rates. From this series of experiments it was found that as the oral temperature fell, so did the pulse rate. Currie also found that the body temperature continued to fall even when the patient was removed from the water. It still fell when the patient was placed immediately in water at body temperature.

Another important landmark was reached in 1855 when Claude Bernard was the first to notice the presence of hyperglycaemia during hypothermia. During experiments he also discovered that guinea pigs cooled to 64-68°F. in body temperature could be rewarmed successfully. He further demonstrated cooling by sectioning the spinal cord of these animals.

Based on a lecture given to district nurses at the Rcn Birmingham Centre of Nursing Education.

Baron Larrey (Napoleon's surgeon) had a method of chilling the tissues of wounded soldiers during the retreat from Moscow in 1812 while Richardson used ether spray to produce localized analgesia in 1867. Five years earlier, Walther cooled rabbits to 64°F. and then rewarmed them successfully. He found that they were unable to rewarm themselves and if left in a cool room they died. Horvath in 1881 found that hibernating animals could be revived from temperatures nearing 32°F. but non-hibernators failed to survive below 64°F.

In recent times (1938) Fay and Henny experimented with the use of hypothermia in patients in advanced stages of carcinoma. The patients were on large doses of analgesics at the start of treatment but it was found that when the particular parts of the body affected were submitted to a lower temperature, pain was relieved and the growth diminished. Unfortunately the experimenters were soon to be disappointed because within a few months the malignant condition became fatal to the patients. Others now took great interest in the study of hypothermia and its application to the human body. Forbes in 1941 first discovered respiratory changes during hypothermia while in 1953 Lewis and Tafuffic performed the first open-heart surgery by the method of surface cooling. This success continues to this present day. Heart and lung machines have been developed for cooling the core of the body (bloodstream cooling) and can be seen in specialist units in this country.

Physiology of Hypothermia

It is known that there is a direct relationship between the temperature of the body and metabolism. It has been observed that as the body temperature falls from normal so does the oxygen intake. It is known that the fall in metabolic rate of the body (as shown by reduced oxygen intake) is related to temperature. The following figures give a clear indication of this.

Body Temperature °F.	*Oxygen Requirement*
90	65 to 70%
86	50 to 55%
82	40%
77	30 to 35%
68	20 to 25%
50	10%

To describe more simply what happens to the body

during low temperature, the body should be divided into two theoretical parts. These are the 'core', which contains the deep-seated organs of the body described as the contents of the cranium, thorax and abdomen, while the other is the shell. The shell contains the arms, legs and surface areas of the body. During hypothermia the core of the body will show constant temperature readings while the shell can show wide variations. There are two ways of cooling the body, either by cooling the core (bloodstream cooling) or the shell (surface cooling). In accidental hypothermia it is the surface that is cooled.

Surface Cooling

As the temperature surrounding the body decreases, it cools the shell areas. As this begins, the first reaction of the body to its cold environment is to cause extreme vaso-constriction in the superficial zones of the body. This is an attempt by the body to prevent further heat loss and to make a greater blood supply available to the essential organs and muscles. When this happens, shivering occurs unless the patient is taking drugs which inhibit this reaction. During this activity, metabolism rises significantly. If the intense cold continues the vasoconstriction is soon replaced by vasodilation and the blood rushes into the superficial or shell area and there is a greater heat loss from the core of the body. If the patient is left in these conditions, death usually supervenes at about 82°F., although cases of accidental hypothermia have been reported in which younger people have survived at much lower temperatures. If death does occur it will be from hypoxia and results from either respiratory or circulatory failure or both. If it is from circulatory failure the cause will be ventricular fibrillation.

Hyperglycaemia

The kidney, unlike other organs, is very slow to return to normal function after being submitted to a state of hypothermia. It may only return to normal after 24 hours. As the body temperature falls the kidney gradually becomes unable to filter solids properly and glucose is lost from the body through the urine. In prolonged hypothermia at temperatures of 82-80°F. the increase in blood sugar becomes significant. As hypothermia deepens to 77°F. and below, the rate of glucose loss through the kidney becomes alarming. It is important also to know that insulin at these temperatures is not properly utilized. Thus many nurses could be deceived by the presence of glucose in the urine; they think the patient is in a state of hyperglycaemia when in actual fact the body is in desperate need of glucose.

Recognizing Hypothermia

Even in these days it is all too common to meet elderly folk with too little fuel, clothing and food, especially during the winter months. Some old people live in real poverty, and many of them are independent in spirit and refuse National Assistance. This is why there is a most urgent need for a complete reviewing of the welfare services as applied to the elderly and others in real need.

The physician depends very much on the nurse's accurate observation during the developing stages of hypothermia. The first sign that the patient is not well may be that he does not respond so readily to the nurse's greeting one morning. He may appear rather drowsy and may be shivering. It should be remembered that patients on chlorpromazine (Largactil) will not show shivering to any marked degree, if at all. This particular drug either diminishes or abolishes shivering completely and induces hypothermia. If the patient is allowed to remain in this state during the day he will gradually become unaware of his surroundings and of people; he becomes confused and later comatose through lack of oxygen.

Bedrooms are generally extremely cold and many well-meaning relatives seem fanatical about patients receiving adequate fresh air. Too much importance is placed on fresh air, especially during cold and foggy spells. It is still common to see windows open in geriatric and medical wards during cold weather. Perhaps those who have seen the effects of cold in old people will be able to convince others that in some cases their misguided kindness has resulted in severe damage to the patient.

Whether the patient complains of the cold or not depends very much on how long the body has been subjected to cold. As the body becomes very cold the sensation of cold diminishes. Unfortunately, many old people complain bitterly about the cold during the winter months, and it is possible to treat yet another complaint with a shrug of the shoulders. This is why every district nurse and nurse working in a ward where old people are should have as standard equipment a low-reading thermometer (85°-105°F.).

Other patients at risk are those suffering from cerebro-vascular accidents. If the temperature control mechanism is affected in these cases, the body will attempt to conform to environmental temperatures. During cold spells all patients at risk should have their temperatures taken daily. If a patient is found to have a temperature of 95°F. or below, he is in a state of hypothermia and should be removed to hospital immediately. It is not possible to treat such patients successfully at home. In the case of a known diabetic it is essential that immediate hospital help be given.

Treatment

There is still a difference of medical opinion as to whether rapid or slow warming is the better way to deal with a person suffering from accidental hypothermia. If recent published works are studied, it appears that, as far as elderly folk are concerned, a system of gradual warming has its advantages.

Under this system, the patient is placed in a room with an air temperature of approximately 70°F. British publications prefer the upper 60s while their American colleagues prefer the upper 70s. The American higher temperature no doubt takes into account the fact that most homes have central heating and the normal living temperature must be well into the 70s. The patient should have one or two blankets but no local application of heat in the form of hot water bottles or heated cradles should be contemplated. The whole aim of surface warming by this method is to allow the shell of the body to rewarm evenly and not in particular parts only.

Because of the slow return to full function of the kidney, it may be necessary to administer glucose intravenously. Therefore full laboratory facilities should be available. This is one reason for removal to hospital. (On these grounds I cannot support the recent decision of the London Borough of Richmond-on-Thames to help old people in a state of hypothermia with additional portable heating.)

Two of the most common complications of hypothermia

in old folk are pneumonia and bronchitis. Antibiotics may be given but care has to be exercised by the physician if the patient's temperature is still low. Nothing is normally administered by mouth until ordered by a doctor as the patient may have a paralytic ileus. Should this be so, a suitable tube is passed into the stomach and the contents aspirated.

Conclusion

The old person is vulnerable and at risk during cold weather at home and at hospital. A failure in the heating system for a few hours is enough to cause this tragic state. Therefore the air temperature in any place where the patient may be expected to remain for more than a few minutes should be maintained at 65-70°F. National Assistance should be based on these temperatures when calculating for fuel. It is essential for the patient who has little or no heat in the bedroom during cold spells to sleep downstairs in the living room. Clothing must be warm, light and adequate.

Always take an old person's temperature when visiting during cold weather. If the temperature falls below 95°F. the doctor should send the patient to hospital. The district nurse can save more lives by accurate observation of her patients than any other person I know in the medical team. If only far more nurses were aware of the possibility of hypothermia in old people and in those suffering from cerebrovascular accidents during cold weather, then many more lives would be saved.

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