A survey on inhalation rewarming and hypothermia treatment

It has been stated that there is no longer any excuse for hypothermia deaths; both the knowledge and technology needed to cope with hypothermia exist - it is now a matter of preparedness and application.

A reduction in the number of preventable hypothermia-related deaths depends on both treatment and prevention strategies. Better treatment techniques increase the likelihood of resuscitation once the victim is rescued. This suggests that education, prevention and treatment are equally important.

It is estimated that 800 recreational boaters, commercial fisherman and merchant mariners die each year in the United States as a result of cold water immersion hypothermia, but most of these deaths appear in mortality statistics as drowning (Harnett et al 1983).

During the collecting of information for this report we contacted many organizations, including the National Clearinghouse for Alcohol Information, the National Clearinghouse for Drug Abuse Information and the National Diabetes Information Clearinghouse in the United States. Despite the fact that alcohol, drugs and diabetes are significant predisposing factors to hypothermia, NONE of these organizations considered hypothermia as a concern.

Statistics on national mortality and morbidity (treatment in an acute care hospital) rates are found in publications of national governments, such as Statistics Canada and the National Centre for Health Statistics (U.S.). These statistics are based on a universal single-cause classification code, the International Classification of Disease, produced by the World Health Organization.

N-CODE

The N-code describes the internal nature of a condition causing death and is equivalent to a medical diagnosis. Accidental hypothermia was adopted as a distinct classification in the 9th edition (1977). It was first used in Canada in 1979. National N-code statistics are not maintained in the United States. The code for accidental hypothermia is N991.6, a subclass of N991, "effects of reduced temperature". This class also includes frostbite injuries and chilblains, as well as "unspecified effects".

E-CODE

The E-code describes the external cause of injuries leading to death or injury. These are not diagnoses but describe the circumstances under which an accident occurs. Hypothermia fatalities are usually classified under E901, "Excessive cold", within the general group "Accidents due to Natural and Environmental Factors". There is no specific classification for hypothermia.

Despite the application of such an apparently simple system, official health statistics based on death certificates tend to under estimate the actual incidence of hypothermia. This is partly due to the nature of a single-cause coding system. If a death certificate reads "broncho pneumonia due to hypothermia", the cause of death is given as broncho pneumonia and no statistical record of hypothermia is made (Adelstein, 1975). According to the coding rules, the direct underlying cause of death must be stated. Zumwalt and Kicklighter (1986) suggest that hypothermia is often considered as a mechanism of death, not as a cause, thereby exacerbating the problem. The issue is further complicated by the fact that hypothermia is frequently not diagnosed or recognized by physicians.

Medical journals are a valuable source of "case studies" in which physicians discuss clinical details of hypothermia cases and compare treatment methods. Scientific journals provide experimental data on different treatment methods as well as other important aspects of hypothermia.

Around 140 Canadians and 800 Americans die each year as a result of hypothermia (Statistics Canada, National Centre for Health Statistics). Most of these fatalities are classified as urban hypothermia. Alcohol or drug intoxication are the dominant precipitating factors (Korpela et al 1986; Western Canada Coroner reports); hypothermia is also common in elderly people, especially those living in poorly heated homes (MMWR 1982). There are suggestions that the unofficial number of hypothermia-related deaths is substantially greater, particularity in the elderly. Taylor (1964) predicted 20,000 hypothermia-related deaths a year in Britain; based on the work of Taylor and Fox et al (1973) in Britain, similar predictions were made for North- America. Besdine (Harvard Medical School) estimated 25,000 hypothermia-related fatalities a year in the U.S.A. while Martyn (1981) suggested 8,000 deaths a year in Canada.

If a hypothermic victim is alive when rescued but dies during recovery treatment, and there is no other significant trauma or disease, this suggests that death may have resulted from either inappropriate or ineffective treatment, or no treatment at all.

Such a statistical approach is not, however entirely satisfactory. Dr. John Hayward suggests that all organizations faced with a probability of treating hypothermia should be prepared to apply the best care available. The fundamental question is simple, if effective treatment technology had been available, would that individual have survived? Are a significant number of people dying because attending personnel are not knowledgeable enough to use up to date technology?

EFFECTIVENESS

In the field treatment of hypothermia, the proven and most effective non-invasive method for CORE temperature stabilization is through inhalation of warm humidified air or oxygen. The RES-Q-AIR system makes this available for any emergency or rescue operation. Experimental evidence (Hayward et al 1984) demonstrates that Inhalation rewarming can arrest afterdrop and enhance stabilization during the crucial 30 minutes following rescue of a hypothermia patient.

Inhalation rewarming is normally slower than other active internal rewarming methods used in hospitals, but slow rewarming is safer in the absence of full physiological monitoring and medical support systems (Paton 1983). Combining efficient heat donation to critical core tissues with a conservative rewarming rate is the most effective and safe way of treating any level of hypothermia in the field. For cases of hypothermia where more rapid rewarming is desired, inhalation rewarming may be used as an adjunct to other internal rewarming techniques, such as peritoneal lavage (Danzl, Oksenholt).

Inhalation rewarming is the only substantiated, non-invasive method of internal rewarming. A simple, non-invasive technique, with its low risk of complications or infections, should be attractive to physicians and cost conscious hospital administrators alike. For example, in order to reduce the risk of complications, Danzl uses inhalation rewarming preferentially and resorts to invasive techniques only when rapid rewarming or diagnostic procedures are required. (personal communication).

The therapeutic benefits of inhalation rewarming are highly appreciated by those applying the technology in stressful treatment situations. Taylor, Sherry et al, Lloyd and Foray (cited by Lloyd, 1987) note the rapid improvement in psychological state and level of consciousness of hypothermia patients in the field; (this has also been frequently reported by the Canadian Coast Guard rescue technicians) an important consideration for both the patient and responders operating in remote locations and under stress conditions, particularly where trauma is involved. For this reason, Taylor stated, "the RES-Q-AIR" method is now our first choice in the rewarming treatment of all stages of hypothermia in the wilderness environment.

Presently inhalation rewarming is used in hospitals, Danzl in Kentucky, Oksenholt in Oregon, Lloyd in Scotland, de Pay in Germany and in Sweden. It is also used for specific circumstances, such as caving rescue (Lloyd 1986), crevasse and mountain rescue (Foray and Cahen 1981, Taylor 1985), at ski resorts (Sherry et al 1986), by some search and rescue groups at various locations in the world and by the Canadian Coast Guard for sea rescues.

The RES-Q-AIR system designed at the University of Victoria appears to be the most effective and best system for inhalation rewarming.

Recognition of the need for improved hypothermia health care varies according to the experience and attitudes of potential users. Individuals who are concerned about providing definitive care and who appreciate the therapeutic benefits of inhalation rewarming, such as Dr. Ian Taylor of British Columbia, recognize the need for the RES-Q-AIR.

Knowledgeable physicians support the use of the RES-Q-AIR systems in ambulances due to the importance of stabilizing a hypothermic patient (the first 30 minutes are crucial in preventing post rescue collapse) especially in remote areas where long transportation times to a hospital or medical post are typical.

The RES-Q-AIR was initially developed to provide an effective and safe internal rewarming method for the field situation. It was not originally intended to replace existing urban hospital rewarming systems. However experience during an actual emergency, involving three acute immersion hypothermia cases, in a local urban hospital has shown that the RES-Q-AIR proved superior in performance, in both, capacity and duration, than other available equipment. However we believe the strongest need for hypothermia treatment technology is applicable to pre-hospital and remote scenarios, i.e. "treatment on site and during transport".

The RES-Q-AIR meets the needs of remote hypothermia treatment scenarios better than any other available product. The ease of operation and convenience of the systems are an attractive and unmatched feature. These units provide PRIMARY CARE in almost any location under the most adverse conditions, including caves and crevasses, for example. The RES-Q-AIR unit is ideal for remote situations, including small bush hospitals. It is also designed for use during transport of hypothermia victims, in ambulances, helicopters, and on board ships.

Units are in use and have been applied during rescues involving hypothermia cases by the Canadian Coast Guard, and have saved lives. Several hypothermia specialists promote use of the RES-Q-AIR in ambulances in remote regions. Ambulance, military and search and rescue requirements are unique and demand "tailored" models. Features such as positive pressure ventilation with oxygen increases the versatility of the system and will make it attractive as a multi-function system. This device will be particularly useful during transport, when available manpower to attend a hypothermic victim is limited, i.e. ambulances, Zodiacs and many other field transport situations, overcoming costs and possible concern with manpower limitations.

Hypothermia is also a concern at ski resorts. The Canadian Ski Patrol reports 21 hypothermia incidents a year at Canadian ski resorts (1 per 19 resorts). In Australia,19 cases of accidental hypothermia occurred at one ski resort over two seasons (Sherry et al 1986). Two of the skiers were successfully treated with the RES-Q-AIR, the other 17 rewarmed spontaneously (blankets, warm drinks). An incident at a B.C. resort raises the interesting problem of skiers getting stranded during chair lift breakdowns. A patrol person says he "almost lost a couple" as a result. Again, hypothermia incidence might be statistically hidden under other trauma (broken limbs), when long periods of immobility and shock place the injured person at risk. Hypothermia is also an issue for cavers (Kreider 1967;Bischoff 1987) and hikers (Pugh 1966).

Hypothermia fatalities are significantly greater in immersion hypothermia, but the evidence is often indirect and fatalities are recorded as drowning. Harnett (1983) estimates that almost 800 recreational boaters, commercial fisherman and merchant mariners die as a result of hypothermia each year in the U.S. On

January 15, 1988, 19 people from the University of Victoria rowing team found themselves immersed in the chilly waters of Elk lake, when stormy weather suddenly erupted, 9 were pulled into the coach boat which headed for shore but got swamped before it got there. They had no other choice than to swim for shore. The occupants of the second shell remained in the frigid waters for another hour, due to the fact that darkness had set in rescuers were severely hampered by this, as well as by the weather conditions and other factors. When finally rescued one victim had already slipped under water, succumbed from hypothermia, while another suffered cardiac arrest. They were all taken to local hospitals, where different rewarming methods were applied depending on the level of hypothermia and knowledge of those supplying medical care. The two most severe hypothermia cases (one with a recorded rectal temperature of 24° C. the other at 30.5° C) both unconscious were successfully resuscitated with the RES-Q-AIR without any complications. Both were kept overnight for observation and released at noon the following day.

URBAN HYPOTHERMIA

Hypothermia fatalities are often associated with sociological problems and old age, alcohol and drug intoxication being perhaps the most significant contributing factors. Over 50% of hypothermia deaths reviewed in Manitoba, Alberta and British Columbia are related to alcohol intoxication. In Finland, Korpele et. al. (1986) found that 2/3 of the hypothermia deaths follow serious alcohol consumption. Suicide, psychiatric disturbances and motor vehicle accidents were also contributing factors. Data on the number of people treated for hypothermia is difficult to find.

If a hypothermic person is alive when rescued, but dies during rewarming, and there is no other trauma or disease, this suggests the individual may have died from inappropriate or ineffective treatment. We define a post-rescue death as being "unnecessary", assuming that resuscitation is possible within the limits of existing medical knowledge and skills. This is of course subject to equipment being made available.

The RES-Q-AIR was primarily designed to assist treatment of hypothermia patients in remote locations and during transport to a medical facility. Therefore we consider post-rescue deaths during both pre-hospital and hospital treatment scenarios.

PRE-HOSPITAL FATALITIES

Recent documentation of pre-hospital, post-rescue deaths is rare. Information on such cases probably does exist, but is not published. Steinman (1985) notes that search and rescue hypothermia recovery skills are increasing. Hopefully the number of post-rescue deaths during pre-hospital treatment will decline. Modern hypothermia management is based, to some extent, on unhappy experiences.

Vangaard (Harnett, 1983) reports the case of 16 Norwegian fishermen pulled alive from the North Atlantic - all 16 died shortly afterwards, possibly as a result of exercise-induced core temperature afterdrop. These, and other experiences, lead to better management of hypothermia, by medical professionals and some laymen. Our review of B.C. coroners reports shows that few hypothermia fatalities are treated in hospital. Most are presumed dead on discovery (DOD), after prolonged exposure. This is consistent with findings of an investigation of exposure-related hypothermia fatalities in Washington, D.C. (MMWR,1982). Only 10% of these were taken to hospital, and no treatment results are presented.

The issue of presumed death is an interesting one. In the last decade, the dramatic resuscitation of cold water "drowning" victims has re-defined the limits of life under these circumstances. However, we cannot include DOD's as possible post-rescue deaths since treatment was not attempted and, therefore, cannot have contributed to death. A statement about post-rescue and pre-hospital deaths made by Savard et. al. (1985) states: "With increasing numbers of people participating in both winter and summer outdoor activities, the number of reported cases of accidental hypothermia has escalated, and although no accurate statistics are available, one cannot fail to be impressed by the mortality rate in the post-rescue period."

A review of some of the major anecdotal evidence suggests that mortality rates are generally low during hospital treatment of hypothermia, particularly for primary hypothermia in healthy patients. Success in hypothermia treatment is growing, largely as a result of better over all management and understanding of hypothermia physiology. Treatment of choice is made by the physician; success is often determined by management of the case as well as the underlying features of the hypothermia presented (Paton 1983; Mills 1983).

TREATMENT METHODS AND TECHNOLOGY

The need for improved hypothermia treatment was based on the initial perceived post-rescue hypothermia deaths. We have expanded this however to include the necessity for definitive care. This assumes that the best treatment should be provided for patients, and not that which is merely available or sufficient to prevent death.

PRE-HOSPITAL TREATMENT

An important and often neglected consideration is the stress experienced by first responders in treating hypothermia victims under adverse conditions in the field.

The first 30 minutes following the recovery of a hypothermic patient are the most critical from a treatment perspective, especially after acute cooling where dangers of afterdrop are greatest (Hayward et. al. 1984). Steinman (1984) notes that the primary goal is to stabilize the victim, preventing any further drop in core temperature.

"It is imperative to start rewarming in the field" (Zell and Kurtz 1985).

In some cases, evacuation of the victim is not possible or advisable, and the victim must be rewarmed on-site (Martyn 1981) Severe injuries or arduous terrain may delay transport, as often found in caving and mountaineering accidents. Delay in transporting a patient may also apply to urban settings in a motor vehicle accident, or building collapse, due to earthquakes for example. Bischoff (1987) describes the difficulties of caving rescue: ". . . difficult maneuvering of the stretcher through constricted passages and the negotiation of pits, up or down, with lengths anywhere between 10 and 200 feet. Such an operation may take up to 24 hours to complete . . ." . This problem is worse when complicated with trauma.

Pre-hospital treatment also involves transport of the hypothermic victim to hospital. The need for hypothermia treatment during this stage may depend on transport duration and the severity of hypothermia. In some instances, it may be as little as 10-15 minutes in urban areas, or as long as a day or more in remote regions. If most hypothermia fatalities are occurring in cities within 15 min. of an acute care facility, then the PERCEIVED need for pre-hospital treatment, in respect to the number of "preventable" deaths, is reduced. This is evident from statements made by physicians in Boston and Vancouver B.C. who have said that the low frequency of hypothermia incidents, within close proximity to hospital, does not justify equipping ambulances with hypothermia-dedicated treatment technology. However weather conditions may delay or prolong transportation times, this was not being considered.

A sampling of American cities revealed that the present method of pre-hospital care is restricted to wrapping the cold victim in a blanket. However, this merely provides insulation, which works well for warm people, but has no benefit to a hypothermic patient as pre-hospital care. Interest in a simple and economical rewarming system was expressed.

We have not encountered any discussions, in any type of publication, concerning treatment of a mass hypothermia incident, such as would be encountered during military conflicts, natural disasters or maritime tragedies. Nevertheless, we would suggest that these possibilities are real, such as the Estonia accident in 1994, and that the problem needs to be addressed. Cold exposure was a significant issue in the Falkland Island conflict, both at sea and on land. Cold injuries were also a major problem during the Korean war and WW II (Vangaard 1975), the latter spawning much of the research on hypothermia. Peacetime creates a lack of this awareness and is not representative of that during conflict.

EFFECTIVENESS

Is a comparative measure of the efficiency and benefits of inhalation rewarming in relation to other rewarming methods used in hospitals and pre-hospital settings. It includes a comparison of the RES-Q-AIR to other systems available for inhalation rewarming.

Once treatment has been initiated, it is essential that the method used to treat hypothermia does not complicate the condition. Post-rescue fatalities should not occur, assuming that underlying conditions and the depth of hypothermia allow for resuscitation. Inappropriate management of the hypothermic patient can result in death. The three major concerns during initial treatment of a hypothermic patient are: core temperature afterdrop, rewarming shock and biochemical imbalance.

Treatments that stimulate peripheral circulation (removing clothing, wrapping in blankets) must be avoided in cases of moderate to severe hypothermia. Increased flow of cold blood from the periphery (muscle pumping or aggressive external rewarming) can cause afterdrop, increasing the depth of hypothermia in critical core tissues, especially the heart. Stimulating the peripheral circulation also reduces the blood volume in the body core, causing rewarming shock, and increases the work load on the heart. The blood returning from the periphery can also include metabolic waste products that cause fatal heart arrythmias. For these and other reasons, the safest rewarming techniques put heat directly into the core area.

There are three classes of rewarming techniques - passive external, active external and active internal. Passive external rewarming simply means spontaneous rewarming (shivering). No external heat is added; the patient's own metabolic processes generate heat. This is the simplest and slowest rewarming method, but insufficient for severe hypothermia. Spontaneous rewarming is often the experimental control in comparative treatment research.

Active external rewarming systems include hot water baths, hot water bottles, electric blankets, heating pads, radiant heaters and charcoal heaters (Norwegian Defense Research Establishment, Paton 1983).

Active external rewarming is generally safe only for mild hypothermia, because externally applied heat stimulates the peripheral circulation. The dangers associated with this have been explained; also comparative clinical studies have indicated that active external rewarming has a higher mortality rate than active internal rewarming (Miller et. al. 1980).

Active internal rewarming techniques are usually more complex and can for the most be used by physicians only in a hospital.

Inhalation rewarming is unique in this respect, in that it can be used outside of a hospital by laymen and does not require much training.

HOSPITAL REWARMING METHODS

Active internal rewarming techniques include: gastric, thoracic and peritoneal lavage (circulation of heated solutions in body cavities); diathermy (use of ultra sound and microwave); extra corporeal circulation (circulating and heating of the blood outside the body); and inhalation rewarming (ventilation of patients with heated, humidified air or oxygen). Heated IV solutions are also used, but contribute little heat due to vasoconstriction in the extremities and the cold tissues.

Extra corporeal circulation is used for profoundly hypothermic patients. Rapid core rewarming is possible with this method. However it is a complex procedure that can be accomplished only in intensive care facilities; the risk of complications demands that it is used only when absolutely necessary. Extra corporeal circulation (ECC) is the treatment of choice for profound hypothermia (Paton 1983). The facilities for this method are found only in major medical centers.

Peritoneal lavage is a less complicated procedure and can be used for treating severe hypothermia. Rapid rewarming is also characteristic of this method. Nonetheless, like ECU, it is an invasive method ("surgical") and can result in complications. Danzl (Kentucky) uses this method for severe hypothermia or when other diagnostic procedures are required. Peritoneal lavage is useful for treating hypothermia associated with drug overdose, as it can be used to remove toxins from the body (Harnett 1983).

Inhalation rewarming is the only non-invasive, active internal rewarming technique. There are several features that make it attractive. The technique meets 5 of the 6 criteria for an ideal rewarming method. (Paton 1983). It is non-invasive, permits access to the patient, allows access for resuscitation, allows continued rewarming during resuscitation and is appropriate to the problem, relative to hospital techniques. The only criteria it does not meet is rapid rewarming. However, in cases of moderate or severe hypothermia, rapid rewarming is not desired, and complex procedures associated with the risk of complications are not required.

PRE-HOSPITAL REWARMING METHODS

Until recently, only external methods were available for rewarming a hypothermic person outside of a hospital. The traditional equipment included hot water baths, blankets and hot water bottles. At the present time, almost all ambulances in North America rely on blankets and vehicle heating. Inhalation rewarming is the only substantiated internal rewarming method applicable outside of a hospital. The slow rewarming rate is a built in safety benefit in this situation. Paton (1983) says: ".... there is anecdotal evidence that in the absence of full monitoring and support systems, slow rewarming is safer than over-energetic external rewarming...". Steinman (1985) also points out that the primary goal of search and rescue is to "prevent the patient from getting colder". Therefore, the initial goal is to prevent core temperature afterdrop. The most efficient way to accomplish this is to deliver heat directly to the core, specifically the heart.

Hayward's 1984 study recorded cardiac temperature. In that investigation, there was conclusive evidence that there was no afterdrop associated with the inhalation rewarming method, nor with spontaneous rewarming, but the rewarming rate of the core, especially the heart, was greatest with the inhalation rewarming technique. The rate of rewarming was greatest for the hot water bath therapy (as predicted); however afterdrop of the heart temperature was observed. Harnett et al (1980) found less afterdrop (tympanic, rectal) with inhalation rewarming in comparison with spontaneous rewarming, but did find that the rewarming rate was at least as rapid as other field techniques. They concluded that:

". . . inhalation rewarming was the recommended treatment for profound hypothermia in the field situation . . .".

BENEFITS OF INHALATION REWARMING

NON-INVASIVE

In comparison to other hospital type techniques, inhalation rewarming offers reduced risk of follow-up complications. Its non-invasive quality makes it the only hospital-type treatment applicable in the field situation.

SIMPLE

The procedure is simple and does not require medical training or experience. It is significantly less complex than other hospital techniques or procedures.

SELECTIVE HEAT DELIVERY

Heat is delivered directly to the lungs and heart. The heart is warmed by warm blood returning from the lungs and from conduction of heat through adjacent tissue. The brain is also warmed from this warm blood flow, and from conductive heat flow from the respiratory and nasal cavities. This has a significant positive affect on the respiratory center of the brain, enhancing ventilatory activity. Dr. Ian Taylor and others also observed a quick improvement of the level of consciousness in hypothermic patients, with the inhalation rewarming therapy, during an actual field rescue situation-involving trauma as well.

CONSERVATIVE REWARMING RATE

The relatively slow rewarming rate is beneficial in the field when the first priority is to stabilize the cardiac temperature. Gradual rewarming is appropriate in non-hospital locations.

CARDIOVASCULAR STABILITY

Hayward et al (1984) showed that cardiac output and peripheral resistance are regulated at safer levels in comparison to active external rewarming. This reduces the risk of rewarming shock, and less load is placed on the heart. Harnett (1983) suggests that the direct stabilization of cardiac temperature may be more important than an actual increase of core temperature.

ELIMINATION OF RESPIRATORY HEAT LOSS

In cold environments, respiratory heat loss is significant. The insulating effect of inhalation rewarming makes a substantial contribution in temperature stability and rewarming rate (Lloyd 1986).

PORTABLE
Inhalation rewarming is the only active internal rewarming system that can be taken and applied in the field.

HEMODILUTION
Dehydration is typical of hypothermia. Moisture is taken up in the lung tissues and passed directly into the blood stream, assisting in re-hydration as an added benefit!

AVAILABLE INHALATION SYSTEMS

Humidifiers are designed primarily for the humidification and warming of anesthesia gases at normal body temperature, but have been adapted by hospitals for inhalation rewarming. This is because **no inhalation rewarming equipment, dedicated for treatment of hypothermia, existed before the development of the RES-Q-AIR system.** These humidifiers have a water bath whose temperature is thermostatically controlled. This decreases the need for constant monitoring. However in the hospital situation, a respiratory technician is assigned for airway therapy to each case requiring intensive care.
The humidification and volume produced with these humidifiers is insufficient.

Thermometers are often placed incorrectly (down stream from the patient), not registering the effect of room air being drawn in through a "flow through" facemask, and the inhaled temperature is much lower compared to the RES-Q-AIR (Douwens' personal experience, 1988, during severe hypothermia treatment of two patients in an emergency room situation).

Inhalation rewarming is described by emergency physician, Dr. Ian Taylor, as his group's treatment of choice in wilderness rescue. It has also been included in various emergency medical textbooks, in chapters on emergency care of hypothermia authored by emergency physicians. Other physicians have expressed interest in the RES-Q-AIR systems as a means of reducing post-operative afterdrop.

The general awareness of hypothermia is growing. An increased participation in land-based and water-based recreation over the last 15 years has been accompanied by intensive hypothermia research and education. A very productive research program on immersion hypothermia has been conducted at the University of Victoria (British Columbia) This group has been responsible for the development of survival behaviors (HELP and HUDDLE positions), hypothermia prevention clothing (UVIC Thermo-Float jacket), prevention technology (Sea Seat) and treatment technology RES-Q-AIR. This research has also provided the best data on predicted survival times for man in cold water. The results of this research are widely quoted in cold-water safety brochures.

The risk of hypothermia in the elderly was first raised in Britain in the 1960s; the issue later spread to Canada and the U.S.A. Since 1980, when Rango stated that " old people are freezing to death" and that Congress must take immediate measures, an active education program has been pursued. Following the first International Hypothermia Conference (Rhode Island 1980), a National Center for Accidental Hypothermia, focusing on the elderly, was formed in Maine. In 1984, the House of Representatives Select Committee on Aging published the transcript of a special committee hearing, "Deadly Cold: Health Hazards Due to Cold Weather". Another indication of concern is the pressure to introduce low-reading thermometers to hospitals. This is apparently mandatory in at least one state (Illinois).

Although public attention has been drawn to hypothermia, the focus has been on two groups - recreation and the elderly. The significance of secondary hypothermia is not fully appreciated. Misconceptions of hypothermia still abound, regardless of the publicity and research. Dr. J. Hayward and other associates, are being continually frustrated by media accounts of people dying of hypothermia in less than 5 minutes after falling into cold water. Research and real life experience indicate that people survive cold water immersion much longer than popularly believed. These and other misconceptions are partly based on continued reference to outdated information and "mind set" of the general public.

Recent articles, in medical journals, continue to refer to the need for low-reading thermometers. Standard thermometers are still used in many hospitals, low readings (34.4 C) are considered "an error" (registered nurse personal communication). Samuellson et. al. (1982) suggested that the standard first aid A B C (Airway, Breathing, Circulation) be revised to A, B, C, D, adding DEGREES; the 1987 Journal of Emergency Medicine almanac has not included the suggested change. Avery Moulton (Director, Center for Environmental Physiology, Washington D.C.) remains frustrated by a lack of government action on pharmaceutical drugs that predisposes elderly people to hypothermia. The National Center for Accidental Hypothermia no longer operates since funds were cut off several years ago. National information center for drug and alcohol abuse - the most precipitating factors in hypothermia fatalities - are unaware of the problem.

Awareness of exposure hypothermia associated with recreation, cold-water immersion and, to some extent, with the elderly, is reasonable. But more attention needs to be given to secondary hypothermia. Association of hypothermia with shock resulting from trauma is rarely considered.

RECOGNITION OF INHALATION REWARMING

Support for inhalation rewarming is growing. The conservative rewarming rate is not an issue for physicians who use inhalation rewarming.

Inhalation rewarming is not expected to replace rapid rewarming techniques for treating profoundly hypothermic patients in a hospital environment. It should be used in conjunction with other internal rewarming methods such as peritoneal lavage. Simple and non-invasive methods for moderate and mild hypothermia should be used whenever possible, in order to avoid complications.

Inhalation rewarming is well-suited to this practice. The non-invasive quality of inhalation rewarming should be attractive to physicians and cost-conscious hospital administrators alike. Treatment in pre-hospital settings emphasizes stabilization of a hypothermia victim. Again, the conservative rewarming rate is advantageous. Confusion between rewarming and stabilization may contribute to misunderstanding. Therapeutic benefits of inhalation rewarming in the field are beginning to be appreciated. Partly because of the rapid psychological recovery of patients, Dr. Ian Taylor states that the RES-Q-AIR is North Shore Rescue's "treatment of choice". Dubas (1986), referring to avalanche and crevasse accidents in the Alps, also emphasizes the importance of "psychological contact."

The use of inhalation rewarming in ambulances is appreciated, particularly in remote areas. However, physicians have had difficulty putting inhalation rewarming devices in urban ambulances, based on relative perceived infrequency of use. However, few of these individuals raise the problem of hypothermia and trauma-induced shock, an event that can happen frequently and even during summer months (Martyn 1981).

SUMMARY

Appreciation and use of inhalation rewarming has grown. Inhalation rewarming is used in hospitals and pre-hospital settings world wide.

In Canada, Oregon and Kentucky; hospitals in Germany also have changed from active external rewarming to inhalation rewarming. Danzl published a review describing the use of inhalation rewarming in 12 North American centers in September 1987.

Rescue groups in the United States, Canada, Britain, Europe and Australia use inhalation rewarming. Individuals previously not aware of this technique are beginning to realize its benefits.

COST

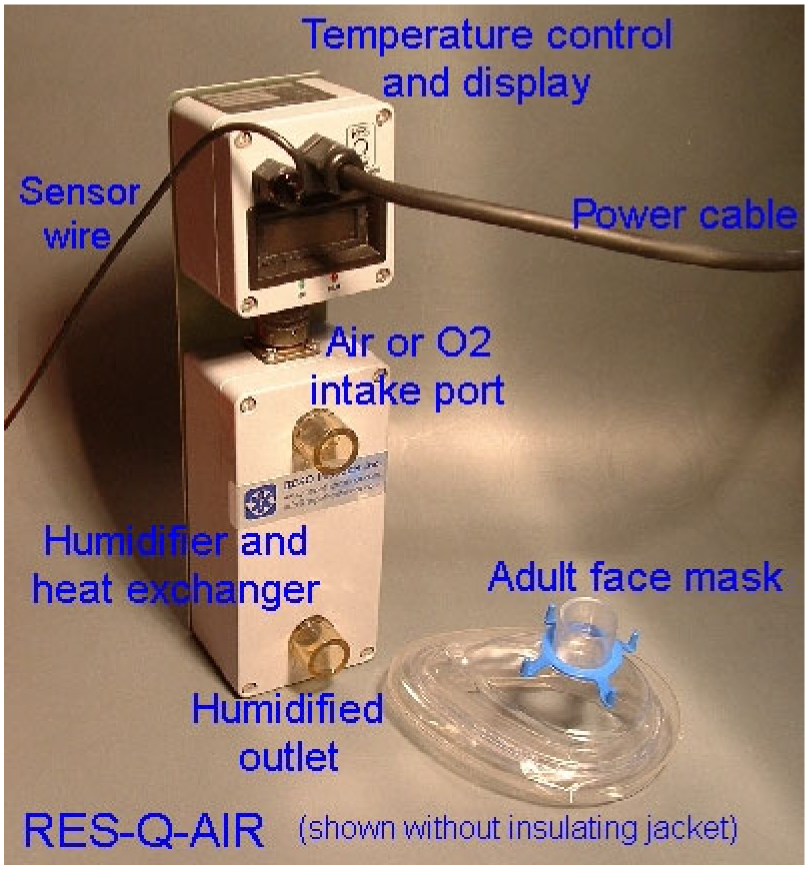
Great expenses are encountered during a rescue; therefore it makes sense to provide a simple to use, and inexpensive means for:

BASIC LIFE SUPPORT during
THE GOLDEN HOUR WINDOW to BRING THEM HOME ALIVE.

RES-Q-AIR

When survival is a matter of DEGREES

First Aid Treatment for Hypothermia



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