Guidelines on Working in Cold Conditions

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What is 'cold'?

Cold is experienced when the body is in circumstances that deplete the body's heat and potentially reduce its core temperature to unsafe levels.

A reduction in the body's temperature results in a range of protective responses from the body including shivering, vasoconstriction and at times peripheral vasodilation. These protective mechanisms have limited benefit and can become overwhelmed.

Outcomes of exposure to cold

Even where the harm is not directly caused by cold, the effects of exposure can increase the risk of other types of injury or exacerbate existing health conditions.

The range of potential adverse workplace health and safety outcomes includes:

- Discomfort from cold stiff hands and feet, runny nose and shivering.
- Reduced manual skills, dexterity, coordination and accuracy with impact on productivity and patient safety (from procedural accidents).
- Increased risk of musculoskeletal injuries from stiffness of muscles and joints and reduced peripheral circulation.
- Increased risk of accidents from reduced alertness, manual dexterity and coordination, e.g. increased risk of body stress, needlestick and sharp injuries.
- Aggravation of medical conditions such as, asthma and arthritis.
- Difficulty maintaining the core body temperature and comfort of patients and workers, especially where patients have medical conditions affecting circulation.
- Potential impact on patient mobility and pain levels.
- Chilblains – red, swollen, tender, itchy patches.
- Trenchfoot – a serious condition resulting from exposure to cold and wet. Symptoms include swelling, numbness, pain, discolouration and blisters.
- Frostbite – results when tissue freezes and is damaged. There is a loss of sensation and a risk of infection and gangrene.
- Core temperature and hypothermia. Hypothermia is potentially fatal and results from a reduction in the body's core temperature. Symptoms become evident as the body's temperature drops below 36.0^{o}C (rectal) or 35.5^{o}C (oral). Severe hypothermia is defined as a core temperature of less than 33.0^{o}C[1].
- Symptoms include shivering, pain in extremities, numbness, loss of fine motor coordination, clumsiness, reduced alertness, very cold extremities, and, as the core temperature continues

to fall, weakness, confusion, slurred speech, drowsiness, reduced pulse and respiration, shivering stops, dilated pupils, and unconsciousness.

Responsibilities

A Person Conducting a Business or Undertaking (PCBU) is required by the *Work Health and Safety Act NSW 2011* to ensure, as far as reasonably practicable, the health and safety of workers and other persons in the workplace. This includes all places of work including but not limited to hospitals, clinics, residences, and service vehicles.

The *Work Health and Safety Regulation 2011* requires a PCBU to identify, assess and control risks arising from cold including the provision of adequate ventilation and air movement, and appropriate systems of work and rest regimes to allow workers to be able to carry out work without risk to health and safety (clause 40(e)(f)).

Clause 43 requires a PCBU to ensure emergency plans are prepared in the workplace. Such plans must include all foreseeable risks including working in extreme conditions.

Officers must act to control risks that have been identified or reported by workers or others. Workers are responsible for reporting potential risks arising from cold working conditions and for reporting any symptoms in themselves, other workers or patients.

Identification and assessment of risk

Hazard identification and risk assessment must be carried out in consultation with the relevant Health and Safety Representative (HSR) and workers, including the workers at risk of exposure to cold.

All risk factors and foreseeable risks need to be taken into account when determining elimination and risk minimisation control strategies. This includes events that may occur only infrequently or rarely, e.g. vehicle breakdown or facility air conditioning/heating breakdown.

Risk factors include:

- Air temperature. Air temperatures below 16^0C are a significant risk, and serious harm can occur at temperatures below 10^0C.
- Air velocity. The higher the air velocity the greater the chill factor resulting in a lower effective temperature.
- Humidity and wetness. High humidity and wetness from sweat or other sources increase heat loss from the body.
- Fatigue.
- Physical activity level. The lower the activity level the less heat is generated by the body. People with low activity levels are therefore most affected by cold.
- Clothing. Multiple layers of clothing are best. Dehydration and inadequate food intake reduce the body's ability to maintain body temperature. If wetness is an additional factor, the outer layer of clothing must be waterproof.
- Health, fitness, ~~or~~ obesity and some medications may also increase risk. Diseases and medications that affect circulation increase risk of harm from cold. Examples include

diabetes, cardiovascular disease, underactive thyroid, Reynaud's disease, and medications such as tranquilisers and beta-blockers.

- Dehydration and hunger decrease the body's ability to maintain its core temperature.

- Gender. Women have a lower capacity for generating body heat. They lose heat more slowly from the torso but more quickly from the extremities than men.

- Tobacco, alcohol or caffeine consumption. Alcohol decreases shivering (a heat generating mechanism) and increases heat loss by vasodilation. Caffeine increases urine production and blood circulation and hence increases heat loss. Tobacco decreases blood flow to the extremities making smokers more vulnerable to cold injury.

- Tolerance. Frequently exposed parts of the body can develop some tolerance.

The greater the number of risk factors and the more extreme the conditions, the higher the level of risk and the more serious the outcomes. The chart for minimum recommended working temperatures (see below) can be used as an action trigger. Bear in mind that the chart only includes a single risk factor, i.e. temperature, and is intended for indoor work environments. If it is used to assess outdoor environments, or if other risk factors such as wetness or wind are present then adjustments will need to be made.

All environments in which nurses and midwives may find themselves in the course of their work must be considered. For example, community nurses, disaster response personnel**,** transport and air ambulance nurses may work outdoors in inclement conditions at least part of the time.

Nurses and midwives activity levels vary across a shift and may also depend on:

- Which shift is being worked (e.g. nights are often less physically active).
- Patient acuity and work area (e.g. acute ward, community work, outpatients clinic, aged care).
- The nature of the nursing or midwifery position (e.g. clinical versus management).

The activity levels of others in the work area also need to be taken into account, i.e. patients. Since patients tend to be physically inactive, NSWNMA suggests that the minimum temperatures for clinical areas should be 20^{0}C as recommended below for 'light work (mental), sitting'.

Minimum and recommended working temperatures

Safe Work Australia[2] has not issued any recommendations for minimum working temperatures. However, some Canadian state regulations stipulate the following minimum working temperatures for indoor environments and these can be used as a guide.

Table 1: Minimum working temperatures[3]

Activity level	Minimum temperature (°C)
Light work (mental), sitting	20
Light work (work with small tools), sitting	18-19
Light work, standing	17
Moderate physical work, standing	16

Table 2 provides New Zealand Department of Labour recommended temperatures for comfort in indoor working environments. Note that the temperature recommendations are made on the basis that seasonal clothing is worn (e.g. warm clothing in winter), there is no source of radiant heat, humidity of 40-70%, and air speeds are in the range of 0.1-0.2 m/s.

Table 2: Recommended working temperatures (^{0}C) for indoor comfort[4]		
	Sedentary	Active
Summer	19-24	16-21
Winter	18-22	16-19

Options for risk control

If it is not reasonably practicable to eliminate exposure to extreme cold, risks must be minimised, so far as reasonably practicable.

Strategies for risk control must be developed in consultation with health and safety representatives (HSR) and workers ensuring that the workers who may be exposed to cold in the course of their work are included.

Control strategies and action plans, including emergency and emergency/disaster plans, ~~and~~ first aid[5] procedures and equipment should be developed for all foreseeable situations including those that may occur infrequently or rarely, e.g. vehicle breakdown, alpine conditions and disaster response at site of incident.

Control strategies should be documented and revised periodically or if there is reason to suspect that they may not be adequate. These plans should also be reviewed after activation of the plan.

Training must be provided to managers and workers.

Control options include:

- Adequate heating of indoor environments including vehicles (see tables 1 and 2 above for guidance on minimum and recommended indoor temperatures).
- Routine maintenance of heating equipment and vehicles to prevent breakdown, and arrangements for rapid response by maintenance personnel in the event of breakdown.
- Planning for the possibility of equipment breakdown by development of contingency plans.
- Provision of clothing and equipment that can be used if vehicles breakdown.
- Provision of adequate clothing and personal protective equipment including waterproof clothing as needed. This includes uniform options suited to the range of working environments that workers experience.
- Access to hot drinks.
- Rest breaks to allow workers to warm up and maintain hydration and food intake.
- Administrative measures including rotation of staff and work organisation.
- Workers who are working in very cold conditions must not work alone.
- Provision of information and training for managers and workers on appropriate clothing, the risks of working in cold, and the signs and symptoms of cold stress/illness.
- Contracting with clients in the community to provide heating during the worker's visit.
- Procedures for procurement of premises and vehicles should ensure that adequate heating is available and in good working order.

- Providing opportunities for workers not accustomed to working in cold conditions to acclimatise, e.g. job rotation and regular rest breaks[2].

Advice on clothing for cold conditions[6]

- Multiple light, loose-fitting layers are best. The innermost layers must remain dry.
- Hats (beanie styles that cover ears are best) and scarves will significantly reduce heat loss from the head and neck.
- Footwear should not allow feet to get wet. Two layers of socks or a light inner sock may be considered for very cold conditions. Footwear should be large enough to comfortably accommodate socks. Compression of socks will reduce the insulation effect.
- Damp or wet clothing (including socks) should be changed as wetness increases heat loss.
- Gloves or mittens to keep hands warm.
- If wet environments may be a factor, then the outermost layer of clothing must be waterproof, e.g. jacket, gloves, hat, boots.

Note
The term 'patient' refers to all users of health, residential aged care and community services including residents and clients.

References

1. Department of Labour (NZ), Occupational Health and Safety Service, 1997, *Guidelines for the Management of Work in Extremes of Temperature.*
2. Safe Work Australia (2011). Managing the Work Environment and Facilities Code of Practice.
3. Canadian Centre for Occupational Health and Safety, OHS Answers, Working in extreme hot or cold temperatures. What are exposure limits for working in the cold?
4. Department of Labour (NZ), Occupational Health and Safety Service, 1997, What you need to know about temperature in places of work, Information Sheet No 3 – What you need to know about thermal comfort
5. Safe Work Australia (2016**)**. First Aid in the Workplace. Code of Practice.
6. Canadian Centre for Occupational Health and Safety, OHS Answers, Cold Environments – Working in the Cold.