



ANNEX

PUBLIC HEALTH RESPONSE TO HEAT-WAVES: A SET OF INFORMATION SHEETS

1. Recommendations for the public during heat-waves
2. Vulnerable population groups
3. Recommendations for general practitioners
4. Some recommendations for retirement and care home managers
5. Adverse effects of drugs during hot weather
6. Considerations for medical professionals regarding drinking recommendations during hot weather and heat-waves
7. Key principles of heat risk communication
8. Mild and moderate heat illnesses and their management
9. Management of life-threatening heatstroke
10. Reducing indoor temperatures during hot weather

1. Recommendations for the public during heat-waves

Keep your home cool

During the day, close windows and shutters (if available) especially those facing the sun. Open windows and shutters at night when the outside temperature is lower, if safe to do so.

If your residence is air conditioned, close the doors and windows.

Electric fans may provide relief, but when the temperature is above 35 °C, fans may not prevent heat-related illness. It is important to drink fluids.

Keep out of the heat

Move to the coolest room in the home, especially at night. If it is not possible to keep your home cool, spend 2–3 hours of the day in a cool place (e.g. air-conditioned public building).

Avoid going outside during the hottest time of the day.

Avoid strenuous physical activity.

Stay in the shade.

Do not leave children or animals in a parked vehicle.

Keep the body cool and hydrated

Take cool showers or baths.

Alternatives include cold packs and wraps, towels, sponging, foot baths, etc.

Wear light, loose fitting clothes of natural materials. If you go outside wear a wide brimmed hat or cap and sunglasses.

Drink regularly and avoid beverages with sugar or alcohol.

Help others

If anyone you know is at risk, help them to get advice and support. Elderly or sick people living alone should be visited at least daily.

If the person is taking medication, check with the treating doctor how they can influence the thermoregulation and the fluid balance.

If you have a health problem:

- keep medicines below 25 °C or in the fridge (read the storage instructions on the packaging);
- seek medical advice if you are suffering from a chronic medical condition or taking multiple medications.

If you or others feel unwell:

- try to get help if you feel dizzy, weak, anxious or have intense thirst and headache; move to a cool place as soon as possible and measure your body temperature;
- drink some water or fruit juice to rehydrate;
- rest immediately in a cool place if you have painful muscular spasms, most often in the legs, arms or abdomen, in many cases after sustained exercise during very hot weather, and drink oral rehydration solutions containing electrolytes; medical attention is needed if heat cramps are sustained for more than one hour;
- consult your medical doctor if you feel unusual symptoms or if symptoms persist.

△ If one of your family members or people you assist presents hot dry skin and delirium, convulsions and/or unconsciousness call the doctor/ambulance immediately. While waiting for the doctor/ambulance move him/her to a cool place and put him/her in a horizontal position and elevate legs and hips, remove clothing and initiate external cooling, such as with cold packs on the neck, axillae and groin, continuous fanning and spraying the skin with water at 25–30 °C. Measure the body temperature. Do not give acetylsalicylic acid or paracetamol. Position unconscious person on their side.

FOR SERVICE PROVIDERS

Information on helplines, social services, ambulances, cool spaces and transport needs to be provided on the information material!!

Provide access to cool spaces and ensure active assistance for those most at risk.

2. Vulnerable population groups

In addition to the general information, information for the elderly (and the very elderly) and people with chronic diseases (see table below for more detail) should contain:

- practical tips (e.g. for keeping cool and well hydrated);
- first aid treatment; and
- important contact details for social and medical services as well as the ambulance.

Other population groups that may need to be considered for specific information may include workers, athletes, tourists and parents of infants. Particularly for the elderly, the socially isolated and the homeless, passive information through leaflets and brochures has proven not to be sufficiently effective and other more active approaches need to accompany any public health measures, such as a buddy system, visits and phone calls.

Conditions which increase the risk of dying in a heat-wave	
	Main ICD ^a chapters
Diabetes mellitus, other endocrine disorders	E10–E14
Organic mental disorders, dementia, Alzheimer's	F00–F09
Mental and behavioural disorders due to psychoactive substance use, alcoholism	F10–F19
Schizophrenia, schizotypal and delusional disorders	F20–F29
Extrapyramidal and movement disorders (e.g. Parkinson's disease)	G20–G26
Cardiovascular disease, hypertension, coronary artery disease, heart conduction disorders	I00–I99
Diseases of the respiratory system, chronic lower respiratory disease (COPD, bronchitis)	J00–J99
Diseases of the renal system, renal failure, kidney stones	N00–N39

^a *International Classification of Diseases*

Note. This table only addresses chronic (long-term conditions) and not acute diseases. Infections, fever, gastroenteritis and skin infections are also risk factors for heat-related mortality (see EM Kilbourne (1997). Heat waves and hot environments. In: E Noji, ed. *The public health consequences of disasters*. New York, Oxford University Press:245–269).

3. Recommendations for general practitioners

Develop a proactive approach by:

- understanding the thermoregulatory and haemodynamic responses to excessive heat exposure;
- understanding the mechanisms of heat illnesses, their clinical manifestations, diagnosis and treatment;
- recognizing early signs of heatstroke, which is a medical emergency;
- initiating proper cooling and resuscitative measures (for early signs and out-of-hospital treatment please see the separate information sheet on treatment of heatstroke and other mild heat-related illnesses);
- being aware of the risk and protective factors in heat-wave-related illness;
- identifying the patients at risk and encouraging proper education regarding heat illnesses and their prevention (education of guardians of the old and infirm and infants is important);
- including a pre-summer medical assessment and advice relevant to heat into routine care for people with chronic disease (reduction of heat exposure, fluid intake, medication);
- being aware of the potential side effects of the medicines prescribed and adjusting dose if necessary, during hot weather and heat-waves;
- making decisions on an individual basis, since there are – according to current knowledge – no standards or formal advice for alteration in medications during hot weather;
- being aware that high temperatures can adversely affect the efficacy of drugs, as most manufactured drugs are licensed for storage at temperatures up to 25 °C; ensuring that emergency drugs are stored and transported at proper temperature;
- being prepared to monitor drug therapy and fluid intake, especially in the old and infirm and those with advanced cardiac diseases.

Educate, counsel and inform patients regarding:

- the importance of adhering to the recommendations spelt out in the leaflet for the public;
- individual adjustments of behaviour, medication and fluid intake according to clinical status;
- contact details of social and medical services, helplines and emergency services

Source: adapted from A Bouchama (2007). *Thermophysiology, pathophysiology and clinical management of heat related illness*. Riyadh, King Faisal Specialist Hospital and Research Centre.



4. Some recommendations for retirement and care home managers

See information sheet 1 (recommendations for the public during heat-waves) for advice on how to keep the facilities cool and ensure that patients and residents keep out of the heat, cool and hydrated.

Monitor indoor temperatures. Provide at least one cool room (e.g. air-conditioned room below 25 °C). Move residents to this cool area for several hours each day.

Ask general practitioners to review clinical management of residents at risk, for example due to chronic disease.

Monitor fluid intake. Offer non-alcoholic, unsweetened beverages.

Monitor body temperature, pulse rate, blood pressure and hydration.

Monitor closely for any early signs of heat illness and initiate appropriate treatment.

Inform and train staff and increase staffing levels if necessary.

5. Adverse effects of drugs during hot weather

Mechanism	Examples
<p>Drugs can:</p> <ul style="list-style-type: none"> • directly affect the central and peripheral mechanisms of thermoregulation; • affect afferent and efferent pathways, sweating, cutaneous vasodilatation; • affect cardiac output and thereby heat elimination. 	<p>Drugs with anticholinergic effects are potent inhibitors of sweating. Antipsychotic drugs may in addition interfere with the central control of the body temperature.</p>
<p>Drugs can aggravate heat illness.</p>	<p>Vasodilators including nitrates and calcium channel blockers can worsen hypotension in vulnerable patients.</p>
<p>Heat exposure can increase toxicity and/or decrease the efficacy of drugs.</p>	<p>Toxicity of drugs with a narrow therapeutic index, such as digoxin or lithium, may be enhanced.</p>
<p>Dehydration and changes in blood volume distribution associated with excessive heat exposure and the thermoregulatory response can influence drug levels, their kinetics and excretion and hence their pharmacological activity.</p>	

△ Drugs need to be stored and transported at temperatures below 25 °C or in the fridge if indicated. High ambient temperatures can adversely affect the efficacy of drugs, as most manufactured drugs are licensed for storage at temperatures up to 25 °C. This is particularly important for emergency drugs including antibiotics, adrenergic drugs, insulin, analgesics and sedatives.

Source: adapted from A Bouchama (2007). *Thermophysiology, pathophysiology and clinical management of heat related illness*. Riyadh, King Faisal Specialist Hospital and Research Centre; and from existing European heat–health action plans.

6. Considerations for medical professionals regarding drinking recommendations during hot weather and heat-waves

“Drinking a lot” means ingesting the volume of water needed to compensate for the fluid deficit (essentially the urine and sweat losses) by approximately 150%.^a

During hot weather and heat-waves, people have to drink even if they do not feel thirsty! This is particularly true for the elderly who have a decreased perception of thirst.

Excessive drinking of pure water can lead to severe hyponatraemia, potentially leading to complications like stroke and death. The addition of sodium chloride and other soluble substances in the beverage (20–50 mmol/l of beverage) decreases the urinary water loss and facilitates the recovery of the fluid balance.^a

Each individual older person or patient needs to receive personalized drinking recommendations depending on his or her health status. Individuals can be differentiated as follows:

- healthy old adults;
- vulnerable people, whose risks are increased in cases of heat stress through haemoconcentration (increased viscosity, red cell and platelet counts) and possible coronary thrombosis, cerebrovascular ischaemia and renal insufficiency;^b
- patients with a history of stroke, hypertension, diabetes, coronary events, renal insufficiency or dementia.

Guidance has to be adapted, accessible and understandable to various categories of people: the lay public, health care professionals and medical staff.

^a RL Sharp (2006). Role of sodium in fluid homeostasis with exercise. *Journal of the American College of Nutrition*, 25:231S–239S.

^b D Raphael et al. (1995). Frailty: a public health perspective. *Canadian Journal of Public Health*, 86 (4):224–227.

7. Key principles of heat risk communication

Trust

The overriding goal is to communicate with the public in ways that build, maintain or restore trust.

Announcing early

The parameters of trust are established in the first official announcement. This message's timing, candour and comprehensiveness may make it the most important of all communications.

Transparency

Maintaining the public's trust throughout an event requires transparency (communication that is candid, easily understood, complete and factually accurate). Transparency characterizes the relationship between the event managers and the public. It allows the public to view the information-gathering, risk-assessing and decision-making processes associated with extreme events response.

Understanding the public

Understanding the public is critical to effective communication. It is usually difficult to change pre-existing beliefs unless those beliefs are explicitly addressed. And it is nearly impossible to design successful messages that bridge the gap between the expert and the public without knowing what people think. Early risk communication was directed at informing the public about technical decisions (known as the "decide and tell" strategy). Today, risk

communicators teach that crisis communication is a dialogue. It is the job of the communicator to understand the public's beliefs, opinions and knowledge about specific risks.

This task is sometimes called "communications surveillance". The public's concerns need to be appreciated even if they seem unfounded.

What can the individual do? Risk communication messages should include information about what the public can do to become safer. It is important to agree with the media at the beginning of the season as to what the key messages to be announced are, concerning what people or health professionals should do in order to avoid health impacts during heat-waves. Once a heat warning is issued these messages could be repeated through all channels.

The content of specific behavioural and medical advice varies across public health response plans and cultures. It has been stressed by researchers that passive dissemination of advice may not be sufficient to reach those people most at risk and they suggest following the example of some public health response plans that integrate and strengthen active identification and care of people at risk. To ensure service delivery, it may be effective to merge preparedness plans for various kinds of extreme events into the national emergency plan.

Source: adapted from WHO Regional Office for Europe (2005). *Health and climate change: the now and how – a policy action guide*. Copenhagen, WHO Regional Office for Europe (<http://www.euro.who.int/document/E87872.pdf>, accessed 28 March 2008).

8. Mild and moderate heat illnesses and their management

Medical condition	Signs and symptoms/ mechanisms	Management
Heat rash	<p>Small red itchy papules appear on the face, neck, upper chest, under breast, groin and scrotum areas.</p> <p>This can affect any age but is prevalent in young children. Infection with <i>Staphylococcus</i> can occur.</p> <p>It is attributed to heavy sweating during hot and humid weather.</p>	<p>Rash subsides with no specific treatment. Minimize sweating by staying in an air-conditioned environment, taking frequent showers and wearing light clothes. Keep the affected area dry.</p> <p>Topical antihistamine and antiseptic preparations can be used to reduce discomfort and prevent secondary infection.</p>
Heat oedema	<p>Oedema of the lower limbs, usually ankles, appears at the start of the hot season.</p> <p>This is attributed to heat-induced peripheral vasodilatation and retention of water and salt.</p>	<p>Treatment is not required as oedema usually subsides following acclimatization. Diuretics are not advised.</p>
Heat syncope	<p>This involves brief loss of consciousness or orthostatic dizziness. It is common in patients with cardiovascular diseases or taking diuretics, before acclimatization takes place.</p> <p>It is attributed to dehydration, peripheral vasodilatation and decreased venous return resulting in reduced cardiac output.</p>	<p>The patient should rest in a cool place and be placed in a supine position with legs and hips elevated to increase venous return.</p> <p>Other serious cause of syncope need to be ruled out.</p>
Heat cramps	<p>Painful muscular spasms occur, most often in the legs, arms or abdomen, usually at the end of sustained exercise.</p> <p>This can be attributed to dehydration, loss of electrolytes through heavy sweating and muscle fatigue.</p>	<p>Immediate rest in a cool place is advised. Stretch muscles and massage gently.</p> <p>Oral rehydration may be needed using a solution containing electrolytes.</p> <p>Medical attention should be sought if heat cramps are sustained for more than one hour.</p>
Heat exhaustion	<p>Symptoms include intense thirst, weakness, discomfort, anxiety, dizziness, fainting and headache. Core temperature may be normal, subnormal or slightly elevated (less than 40 °C). Pulse is thready with postural hypotension and rapid shallow breathing. There is no mental status alteration.</p> <p>This can be attributed to water and/or salt depletion resulting from exposure to high environmental heat or strenuous physical exercise.</p>	<p>Move to a cool shaded room or air-conditioned place. The patient should be undressed. Apply cold wet sheet or cold water spray and use fan if available. Lie the patient down and raise legs and hips to increase venous return. Start oral hydration. If nausea prevents oral intake of fluids, consider intravenous hydration.</p> <p>If hyperthermia above 39 °C or impaired mental status or sustained hypotension occur, treat as heatstroke and transfer to hospital.</p>

Source: adapted and updated from A Bouchama, JP Knochel (2002). Heat stroke. *New England Journal of Medicine*, 346:1978–1988; and JP Knochel, G Reed (1994). Disorders of heat regulation. In: MH Maxwell, CR Kleeman, RG Narins, eds. *Clinical disorders of fluid and electrolyte metabolism*, 5th ed. New York, McGraw-Hill Inc.:1549–1590.

9. Management of life-threatening heatstroke

Condition	Intervention	Goal
Out-of-hospital		
Exposure to heat stress (heat-wave, summer season and/or strenuous exercise).	Measure core temperature (rectal probe). If > 40 °C, move to a cooler place, remove clothing, initiate external cooling:† cold packs on the neck, axillae and groin, continuous fanning (or keep ambulance windows open) while skin is sprayed with water at 25–30 °C.	Diagnose heatstroke.* Lower core temperature to < 39.4 °C. Promote cooling by conduction, maintain currents of air. Promote cooling by evaporation.
Changes in mental status (anxiety, delirium, seizures, coma).	Position unconscious patients on their side and clear airway. Administer oxygen 4 l/min. Give isotonic crystalloid (normal saline). Rapidly transfer to an emergency department.	Minimize risk of aspiration. Increase arterial oxygen saturation to > 90%. Ensure volume expansion.
In-hospital		
Hyperthermia	Confirm diagnosis with thermometer calibrated to measure high temperatures (40–47 °C). Monitor skin and rectal temperature; continue cooling.	Keep skin temperature >30 °C. Stop cooling when rectal temperature is <39.4 °C.‡
Seizures	Consider benzodiazepines.	Control seizures.
Respiratory failure	Consider elective intubation (for impaired gag and cough reflexes or respiratory function deterioration).	Protect airway and augment oxygenation (arterial oxygen saturation to > 90%).
Hypotension§	Administer volume expanders, add vasopressors and consider central venous pressure monitoring.	Increase mean arterial pressure >60 mm Hg, restore organ perfusion and tissue oxygenation (consciousness, urinary output, lactate level).
Rhabdomyolysis	Expand volume with normal saline, intravenous furosemide and mannitol or intravenous sodium bicarbonate. Monitor serum potassium and calcium and treat even modest hyperkalaemia.	Prevent myoglobin induced renal injury. Promote renal blood flow and diuresis. Ensure urine alkalinization.
Post-cooling		Prevent life-threatening cardiac arrhythmia.
Multiple organ system dysfunction	Use nonspecific supportive therapy.	Aid recovery of organ function.

* Diagnosis of heatstroke should be suspected in any patient with mental status changes during heat stress even if the temperature is < 40 °C.

† No evidence of one cooling technique superiority over another. Non-invasive techniques that are easy to apply, well-tolerated and less likely to cause cutaneous vasoconstriction are preferred. Antipyretics such as aspirin and acetaminophen should be avoided because of their potential to aggravate the coagulopathy and liver injury of heatstroke.

‡ There is no evidence to support specific endpoint temperature to halt cooling. However, a rectal temperature of 39.4 °C has been used in large series and proved to be safe.

§ Hypotension usually responds to volume and cooling. Vasodilatory shock and primary myocardial dysfunction may underline sustained hypotension refractory to volume expansion. Therapy should be individualized and guided by clinical response.

Source: updated from A Bouchama, JP Knochel (2002). Heat stroke. *New England Journal of Medicine*, 346:1978–1988; A Bouchama, M Dehbi, E Carballo-Chaves (2007). Cooling and haemodynamic management in heatstroke: practical recommendations. *Critical Care*, 11(3), available online at <http://ccforum.com/content/11/3/R54> (accessed 1 April 2008).

10. Reducing indoor temperatures during hot weather

Short-term measures for existing buildings

Measures	Comment
Thermometers to measure indoor temperatures	These are useful to measure indoor temperature and to show when action needs to be taken.
Increased external shading	External shading of windows reduces solar heat gains; internal shading of windows to avoid solar loads inside the room is always advisable.
Electric fans	Electric fans may provide relief, but when the temperature is above 35 °C, fans may not prevent heat-related illness – it is important to drink enough fluids.
Mobile evaporative coolers	The cooling effect of evaporative coolers increases with temperature and decreases with relative humidity of the air.
Local air conditioning	Air conditioners provide relief. Please note that if you buy or install air conditioning please use an air conditioner that is as energy efficient as possible. Proper cleaning and maintenance is important to avoid health impacts. Be aware of electricity blackouts in summer time!

In order to reduce indoor temperature in a sustainable way, there are various possible medium- and long-term measures to increase reflection of heat from the surface (albedo) of the building through:

- cool paints (light coloured surfaces present much lower surface temperatures than dark ones);
- coloured material with high reflectivity, such as coating;
- natural reflecting materials.

For a broader range of possibilities (including urban planning and land-use change) please see the publication Heat-waves: risks and responses (2004). Copenhagen, WHO Regional Office for Europe (<http://www.euro.who.int/document/E82629.pdf>).