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Heatwaves and the elderly

The role of the GP in reducing morbidity

Background

Heatwaves are increasing in frequency, intensity and duration, and are associated with an increase in mortality and morbidity, particularly in the very young and the very old. Concurrently, the Australian population is aging, with the prediction that by 2036 approximately 27% of Australians will be aged over 65 years.

Objective

This article reviews the evidence on heat related health risk and discusses the role of the general practitioner in reducing morbidity in older people as a result of heatwaves.

Discussion

Heatwaves are associated with increased mortality and morbidity in people aged over 65 years, and more so in those aged over 75 years. Older people are more vulnerable to the effects of extreme heat through a range of physiological and physical factors. As key providers of healthcare to older people, GPs play a crucial role in identifying those at risk and implementing strategies to minimise the risks of mortality and morbidity during periods of extreme heat.

Keywords: heat stress disorders; hot temperature; aged; frail elderly; primary healthcare

might be expected to result in increased morbidity and mortality across the community.⁵

Over 85% of Australians visit general practitioners each year.⁶ Although severe heat related conditions constitute a medical emergency, and the majority of those seriously affected will attend hospital, the best health protection measures are to reduce hospitalisation through education and training of medical personnel, patients and carers.^{5,7} This article reviews the evidence on heat related health risk and discusses the role of the GP and other primary healthcare providers in reducing morbidity in older people as a result of heatwaves.

Method

Literature search strategy

Electronic searches were performed using the following terms: 'heatwave', 'heat stress', 'heat stroke', 'heat related illness and health', and meshed with the terms: 'elderly', 'aged', 'chronic illness', 'mortality, morbidity, primary health care and general practice'. Databases searched were MEDLINE (1950 to January 2011); PubMed (January 1976 to January 2011); Cochrane Database of Systematic Reviews (up to January 2011); and GEOBASE (up to January 2011). A total of 663 articles specifically addressed the health effects of heatwaves (MEDLINE: 618; PubMed: 27; GEOBASE: 18).

Selection criteria

Studies eligible for review included peer reviewed journal articles that reported the effects of heatwaves with specific reference to risk factors in older people, or with reference to the role of primary healthcare professionals. Only English language articles were included for review. Forty-three articles were fully reviewed.

Globally, heatwaves are increasing in frequency, intensity and duration, and are associated with an increase in mortality and morbidity.¹ The most vulnerable to extreme heat are infants, those aged over 75 years, and the medically compromised and frail.^{2,3}

In Australia, annual daily temperatures have increased by approximately 0.9°C since the 1950s.² It is predicted there will be a further rise in global temperature of between 1.1°C and 6.4°C by 2100.⁴ At the same time, Australians are aging, with 27% of the population expected to be aged over 65 years by the year 2036. Unless appropriate intervention strategies are implemented, these factors combined

Defining a heatwave

There is no universal definition of a heatwave although generally it can be defined as ‘a prolonged period of excessive heat’.⁸ In Australia, heatwave definitions vary between locations (*Table 1*). A heatwave is usually considered to be a period of at least 3 successive days where the temperature is at least 5°C above expected, and with an associated increase in night temperature.⁸⁻⁹

Health effects of heatwave

The primary mechanisms for heat elimination are through increased cardiac output, sweat production and blood flow to the skin.¹⁰ When temperatures exceed the adaptive ability of the body, heat stress occurs. If heat stress goes beyond human tolerance, increased body heat production, the inability to eliminate heat, and fluid depletion lead to a range of heat disorders, some of which are fatal.¹¹

Each individual has a level of heat tolerance, and those who live in hot climates are known to acclimatise to local temperatures.¹² Heat stroke can occur even in acclimatised individuals when exposed to continual extreme temperatures, particularly when there is no significant drop in night temperature. The physical manifestations of heat related conditions are many and vary in their intensity and effects (*Table 2*).

Adverse outcomes of heat related manifestations include increased fracture risk,¹³ heat rash (leading to chronic dermatitis and secondary bacterial infection),^{14,15} increased troponin levels with associated reduced 1 year survival,¹⁶ and severe heat stroke – defined as a rise in core body temperature to greater than 40°C, associated with organ malfunction and death.¹⁷

Table 1. Heatwave definitions in Australia (by state)

Area	Definition
Sydney	Two successive days at greater than the 95th percentile of expected temperature for a given location with rolling average of 3 days >27°C
Adelaide	5 days ≥35°C or 3 days ≥40°C
Perth	3 days ≥35°C

Note: The Australian Bureau of Meteorology has no universal definition because air temperature, geographical location, humidity, wind speed and expected local average are all assessed when determining a heatwave

Risk factors for older people

Older people are particularly sensitive to temperature extremes, especially increases in temperature.^{14,15} Risk factors for heat related illness in older people can be divided into four key areas:

- physiological^{18,19}
- medical^{20,21}
- social^{11,19,22}
- environmental.^{11,19,23}

Each of these risk classifications interacts with the others, and cannot be considered in isolation. Risk factors for heat related morbidity and mortality are cumulative and increase with the number and type of risk.

Physiological and medical risks

Age related physiological changes increase the risk of heat related illness. Thermoregulatory function declines with age, and whether a person can accurately discriminate between heat and cold affects whether they take action to reduce the likelihood of associated adverse effects.¹⁸ As people age their perceptions of temperature and risk alter.^{24,25} Studies on perception of risk have been conducted in the United Kingdom, but no similar studies have been conducted in Australia.²⁵

The aging heart is less able to increase its workload to meet the demands of extreme heat.^{14,26} A decline in cardiac reserve and a reduction in vascularity decrease peripheral blood flow and reduce the efficiency with which heat can be dissipated. The aging process causes alterations to the skin and supporting structures, including reduced numbers and efficiency of sweat glands.^{14,27} Unless sweating occurs, body temperatures can rise to dangerous levels. The ability to perspire is affected by many

medications, some of which reduce sweating, and others which reduce the amount of fluid available for perspiration to occur.^{26,28}

Some medication and medication interactions can increase the likelihood of heat related conditions. Sedatives, antidepressants and antipsychotics can cause lethargy, altered cognition and memory impairment, leading to decreased mobility, increased sleep, reduced sweating and less desire to drink fluid.¹⁴ Limiting fluid intake either unconsciously, or for medical reasons, amplifies the impact of heat stress in older people. Beta blockers and anticholinergic drugs cause reduced vasodilation and decrease sweat production, and angiotensin converting enzyme inhibitors reduce thirst.²⁹ Vasodilators aggravate heat illness by exacerbating hypotension, and antipsychotics increase core body temperature.

Diminished fluid intake and subsequent dehydration in older people can lead to hyperkalaemia and subsequent life threatening cardiac arrhythmia. Dehydration can be caused directly by alcohol and excess caffeine intake and diuretic medication. It increases heat stress risk, particularly when patients take medication with a

Table 2. Physical manifestations of heat related effects

Heat stress

- Increased sweating
- Facial redness
- Thirst
- Lethargy
- Dizziness

Heat exhaustion

- Elevated temperature
- Thirst, nausea and vomiting
- Wet skin
- Pallor or flushing
- Rapid, weak pulse
- Rapid shallow breathing
- Muscle pain and cramps

Heat stroke

- High core temperature
- Nausea, vomiting, diarrhoea
- Weakness, dizziness, lethargy
- Feeling hot, headache, confusion
- Skin, dry and hot
- Tachycardia, full bounding pulse
- Tachypnea

narrow therapeutic index in dehydration such as warfarin and digoxin.^{14,29} The elderly develop renal failure more quickly than the young and exhibit diminished renal tubular conservation of sodium and water during periods of dehydration.^{15,30} Dehydration in these circumstances is often followed by hypernatraemia and hyperviscosity, with an associated increased risk of coronary and cerebral thrombosis and central nervous system dysfunction.^{20,31} Hyperkalaemia is more common in the aged, even in the absence of renal disease, due to an age related decline in glomerular filtration rate.

Poor mobility is one of the most important contributors to heat related health risk as people are less likely to be able to 'move' to keep cool in the heat.³² Early identification of people who have multiple risk factors is one strategy to reduce heat related illness and death^{33–35} (*Table 3*).

Social and environmental risks

Advanced age is the most significant factor in heat related death in the United States of America, however, no similar research has been conducted to ascertain such a statistic in Australia.¹⁰ Older people are more likely to live alone, have reduced social contacts, experience co-existing chronic illness, and have a lower socioeconomic status with limited financial resources, all significant risk factors for heat related effects.²³

A cool environment reduces the adverse health effects of extreme heat, but although home air conditioning is optimal, lack of disposable income may mean many older people use fans instead.³⁶ Fans circulate air, but assist cooling only when there is a high level of humidity as they facilitate sweat evaporation.³⁷

Ethnic minority groups and/or the elderly tend to live in less expensive, warmer neighbourhoods, with not only greater exposure to heat stress, but fewer resources to cope with it.³⁸ City dwellers are exposed to additional factors associated with heat related death including high density housing, lack of green space and higher temperatures. Studies in France have shown that some housing types, including high rise, high density, portable (aluminium) housing, or housing with poor ventilation, or no insulation, increase risk.²² Studies following the 2003 European heatwave found significant increases in mortality in residents of nursing homes and institutions.^{32,39}

Although these studies focused on the effects of air conditioning in nursing home residents, the results showed that many variables, such as patient mobility and carer knowledge, must be considered, not just temperature.³²

The role of the GP

One of the few social interactions many isolated older people experience is a visit to the GP. Older people generally have a strong relationship with their GP, and trust their advice and skill.⁶ This interaction, whether it is in a clinical setting or in the home, is an ideal opportunity for the GP to identify risk factors that may be exacerbated

by extreme heat. Those at risk of death in a heatwave are relatively easy to assess.^{3,11} The challenge for GPs is to identify patients at risk, and integrate a heatwave mitigation strategy based on risk factors. A process for identification and management of patients during heatwaves is outlined in *Table 3*.

Emphasising the importance of staying cool, wearing light clothing, reviewing medications and promoting appropriate lifestyle behaviours in older people will reduce the likelihood of heat related illness. Links with community based health professionals assist GPs to manage those at risk during extreme heat.⁴⁰

Table 3. Heatwave management plan for general practice

Identifying elderly patients at risk	
Chronic illnesses	Heart disease, mental illness, respiratory disease, diabetes, obesity, hypertension or renal disease, addictions (including alcohol or coffee)
Polypharmacy and drugs that impair sweating and thirst	Beta blockers, antidepressants, antihistamines, antipsychotic drugs, diuretics, alcohol, antihypertensives, warfarin and digoxin
Limited function	Poor or limited mobility, confusion or cognitive impairment, those at known risk of falling or who have had previous falls
Social factors	Poor self care, live alone or who have poor support networks, low socioeconomic status, poor quality housing or homeless, or living in a care facility
Lifestyle factors	Play outdoor sports (bowling, tennis) or exercise outdoors
Acute illness	Infection, dehydration or heat stress
Review and plan	
Review patients at risk	As patients visit, or if they are part of an aged care visiting program identify any risk factors for heat related illness and include heatwave planning in patient management plans
Review practice systems	Develop a response plan for heatwave days. Ensure medications are kept in a cool environment. Have a plan in case the power supply fails – especially for vaccines and drug refrigerators
Educate	
Patients	Emphasise the importance of light clothing, drinking in hot weather and staying cool. Discuss current medications and plan for hot weather
Staff	Plan for possible power outages and increases in patient load during hot weather. Keep a look out for signs and symptoms indicating heat related illness
Manage	
Assess patients who are experiencing heat related symptoms	History, fluid intake and output, social factors, exercise levels, medications, temperature, skin temperature
Treatment	On an individual basis: provide fluids if indicated, cooling, support and observation. If symptoms are severe, the patient will require hospitalisation

Resource

Heatwave guidelines and detailed heatwave management plans for clinicians can be found on the Victorian Government website www.health.vic.gov.au/environment/heatwave/agencies/professionals.htm.

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