



Therapeutic Brief

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Topic 40: Medicines & hot weather: Reducing the risk of dehydration and heat-related illness

The use of medicines associated with increasing the risk of dehydration or heat-related illness is common in veterans and war widows. Five or more medicines associated with increasing the risk of heat-related illness were dispensed to:

- one in five veterans and war widows with diabetes, dementia, cardiovascular or respiratory disease,
- one in three with chronic renal failure and
- almost half with a psychiatric illness.¹

Having a psychiatric illness and taking psychotropic medicines or having a cardiovascular or respiratory illness is associated with a significant increase in risk of death during hot weather.² Consuming heavy amounts of alcohol is associated with a significant risk of heat-related death, due in part to its diuretic effects, but also to reduced alertness, judgement and perception of heat and thirst.³

Hot days are common in Australia, and are often associated with significant morbidity and mortality, especially in the elderly.⁴⁻⁶ The principal causes of death include dehydration, hyperthermia, heat exhaustion, heat stroke, complications of delirium and exacerbation of a pre-existing illness.^{6,7} Heat-related deaths

most often occur in vulnerable elderly people living at home alone who lack social support and are unable to call for assistance.^{2,8}

Most heat-related illness and deaths are preventable.⁹ Initiation of individualised preventive measures before summer is key to preventing heat-related illness and death.¹⁰

This therapeutic brief identifies older patients most at risk of heat-related illness this summer and suggests strategies to reduce that risk. Older patients most at risk include those:

1. taking certain medicines
2. prone to dehydration
3. having other associated risk factors.

Inside

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Key points

- > High risk patients include older people with a pre-existing illness and poor general health who lack social support and are prescribed certain medicines.
- > High risk medicines include diuretics (especially when combined with an ACE inhibitor or ARB), anticholinergics and psychotropic medicines.
- > When seeing patients before summer, review their medicines and make a hot weather plan.
- > Encourage your patients to stay cool by using an air-conditioner, and maintaining social support during hot weather.

1 Is your patient taking medicines that may increase the risk of dehydration or heat-related illness this summer?

Many commonly prescribed medicines can increase the risk of heat-related illness in a number of ways:

1. Dehydration and electrolyte imbalance.^{9, 11}
2. Impaired sweating.^{10, 11}
3. Reduced thirst sensation.¹¹
4. Hypotension and reduced cardiac output, which may also increase the risk of fainting and falls.^{10, 11}
5. Sedation and cognitive impairment which may reduce alertness, judgement and perception of heat and thirst.⁹⁻¹¹
6. Drug toxicity associated with reduced renal clearance of medicines in dehydrated patients.⁹⁻¹¹
7. Altered central thermoregulation.¹⁰ (See Medicines Insert)

Alterations in the body's thermoregulatory responses due to the effect of medicines may go unnoticed during winter and only become apparent in the heat of summer. Review all of your patients' medicines, including those purchased over the counter and monitor closely.¹²

Use caution when initiating new medicines as they may act together, or with existing medicines, to further impede normal heat responses.¹³ The risk of hospitalisation for heat-related illness in veterans is significantly increased following initiation of an angiotensin converting enzyme (ACE) inhibitor or an angiotensin II receptor blocker (ARB) in combination with a diuretic or following initiation of an antidepressant.¹

Facts about warm weather and heat-related illness

- Mean daily temperatures that exceed 30°C and daily minimum temperatures that exceed 24°C can lead to an increased risk of death.^{14, 15}
- High temperature and humidity is relative to the local climate: weather considered hot in Hobart will be at a considerably lower temperature than weather considered hot in Alice Springs.^{5, 16}
- Rapid onset of hot weather early in summer increases the risk of heat-related illness in older people.^{17, 18}
- Older people living in large cities or dense inner urban areas where the temperature can be 1–3°C hotter than surrounding areas, especially at night, are at a significant risk of heat-related morbidity and mortality.⁵



2 Is your older patient prone to dehydration?

Dehydration is common in older people and can occur quickly.¹⁹ This is partly because of physiological changes that are part of the ageing process, and include:

- impaired renal function
- decreased total body water
- a reduced thirst sensation.²⁰

These changes affect the water/sodium balance and the ability to maintain homeostasis.¹⁹ Older people also have:

- a reduced ability to sweat
- decreased plasma volume
- reduced cardiac output
- decreased blood flow to the skin and extremities
- generally lower fitness, increased body fat and reduced lean body mass.²¹

In the presence of comorbidities and use of multiple medicines, the risk of dehydration and heat-related illness is increased significantly, especially during hot weather.¹⁹

Other contributing factors may include a reluctance to drink fluids because of concerns about bladder control problems, advice from the doctor about fluid restrictions,¹⁷ or a lack of understanding of the importance of proper hydration or²⁰ of perceived vulnerability to the effects of hot weather.²²

Some electrolyte disturbances and elevated glucose levels can increase urine output to predispose the patient to dehydration.^{19, 23} Older people may not feel thirsty even when they are dehydrated.¹⁸

Dehydration can have serious consequences including confusion, falls, respiratory or urinary tract infections, constipation and delayed wound healing.²⁰ It can lead to acute changes in renal function which may increase the risk of toxicity from other medicines that are renally excreted (eg. dabigatran, rivaroxaban, apixaban, digoxin, gliptins, oxycodone, morphine and lithium).²³ Identifying older patients at risk of dehydration is essential as diagnosis of mild dehydration can often be difficult.¹⁹

If an older person complains of substantially reduced urine output and thirst, it is highly likely they are severely dehydrated.¹⁹



3 Does your patient have other associated risk factors?

The people most likely to suffer heat-related illness during periods of hot weather often have clusters of risk factors (see Table 1).^{2, 24}

Many older people consider they are able to cope during hot weather and don't perceive they may be prone to the effects of heat, even if they have a pre-existing chronic condition, live alone or take prescribed medicines.¹⁷
²² In Australia approximately one in five people aged 60–79 years of age and one in three people aged 80 years of age and over, live alone.²⁵

Rapid onset of extreme hot weather early in the season or travelling to other temperature zones that are considerably hotter and more humid increases the risk of heat-related illness in older people.¹⁷

Worsening of a pre-existing illness is the most common reason older people die during hot weather.^{16, 18}

Table 1: Risk factors for heat-related illness^{2, 10, 24, 26}

Taking certain medicines	See Medicines Insert	
Poor general health and comorbidities	<ul style="list-style-type: none"> • Cardiovascular disease • Mental illness including dementia and confusion • Respiratory disease • Diabetes mellitus • Obesity 	<ul style="list-style-type: none"> • Hypertension or renal disease • Substance misuse • Excessive alcohol intake • Neurological diseases, such as Parkinson's disease • Acute illness
Limited function, frailty and physical disabilities	<ul style="list-style-type: none"> • Reduced mobility • Confined to bed or housebound • High dependency level 	<ul style="list-style-type: none"> • Poor self-care or unable to care for themselves • At risk of falls
Socioeconomic factors	<ul style="list-style-type: none"> • Living alone • Low socioeconomic status with limited financial resources • Poor quality housing or homelessness 	<ul style="list-style-type: none"> • Lack of use of or access to air-conditioning at home • Living in dense inner urban areas especially on the top floor • Social isolation
Lifestyle factors	<ul style="list-style-type: none"> • Playing outdoor sports or exercising outdoors • Lack of access to health care 	<ul style="list-style-type: none"> • Unnecessary outdoor excursions • Working outdoors



Recommendations for patients at risk of heat related illness:

Review your patient's medicines and make a hot weather plan

- During hot weather, it is even more important to apply the general principles of prescribing the lowest effective dose for the shortest possible time.²³
- People prescribed a psychotropic medicine are at a particularly high risk because of the combined effect of their illness on behaviour and the medicines they take.² It is especially important in these patients for you to review the dose and to talk about the risks of heat-related illness and protective measures they can take.
- If practical, consider delaying initiation or increasing the dose of a psychotropic medicine until the hot weather is over.
- If your patient is prescribed a diuretic, consider reducing the dose during hot weather. If appropriate, consider providing an individualised plan for your patient to adjust their diuretic medicine themselves on hot days.
- If your patient is on fluid restrictions, consider relaxing them during periods of hot weather, if appropriate.
- Give careful consideration when initiating combinations of medicines, such as a diuretic and ACE inhibitor or ARB during hot weather, as together they may increase the risk of hypovolaemia and dehydration.²³ Consider initiating the diuretic at a lower dose.²³
- Consider a medicines review (HMR or RMMR) by an accredited pharmacist. Ask the pharmacist to provide counselling about how to stay well and store medicines safely during hot weather.

Ensure your patient has a good understanding of how to stay well during hot weather, encourage them to:

- Drink small amounts of their preferred fluids, often²⁰ (sports or energy drinks do not appear to provide any added benefits and are an unnecessary extra cost).²¹
- Avoid consuming large amounts of plain water in a short period of time, especially if a low salt diet is being followed.^{10, 29}
- Drink fluids even when not feeling thirsty.¹⁰
- Eat cold foods that have a high fluid content.²⁰
- Observe and report any decrease in urine output to you or their pharmacist.
- Be aware of the early signs of dehydration/heat stress
 - report any symptoms that worry them to you or their pharmacist.
- Stay cool by:
 - using the air-conditioner at home (using an air-conditioner at home or having access to air-conditioned areas, such as shopping centres, is associated with a lower risk of death during hot weather).²
 - staying indoors out of the heat during the hottest part of the day, and taking extra showers if able.¹⁰
 - wearing lightweight, loose fitting clothes.¹⁰
 - keeping the home as cool as possible.¹⁰
- Maintain frequent contact with family, friends or carers.¹⁰

Organise or provide contact details for support services for your patient living alone and isolated:

- **DVA Veterans' Home and Community Care program:** available to veterans and war widows/widowers living independently at home who may need help with personal or respite care, social support or domestic assistance. For further information go to: www.dva.gov.au/benefitsAndServices/health/homecare/Pages/homecare.aspx#hacc
- **Australian Red Cross Telecross program:** a free Australia-wide service that assists people who live alone and are at risk of illness or accident, by telephoning them daily to check on their wellbeing and safety. For further information go to: www.redcross.org.au/telecross or telephone: **1300 885 698**
- **Telecross REDI** is a free South Australian service available to vulnerable and isolated people in the community who may need support during hot weather. For further information go to: www.redcross.org.au/telecross-redi.aspx
- **State heatwave plans** are a good resource for people wishing to seek further information (use a search engine to find each state's heatwave plan).

Full reference list available on the website: www.veteransmates.net.au

Commonly used medicines associated with increasing the risk of heat-related illness.^{9-11, 23}

Class of medicines	Possible effects	
<p>Antidepressants</p> <ul style="list-style-type: none"> ➤ Tricyclic antidepressants (TCAs) <ul style="list-style-type: none"> » For example amitriptyline » These medicines have strong anticholinergic effects ➤ Selective Serotonin Re-uptake Inhibitors (SSRIs) <ul style="list-style-type: none"> » For example sertraline, citalopram and escitalopram ➤ Serotonin and Noradrenaline Re-uptake Inhibitors (SNRIs) <ul style="list-style-type: none"> » For example venlafaxine, duloxetine and desvenlafaxine ➤ Mirtazepine 	<ul style="list-style-type: none"> • Altered central thermoregulation associated with antidepressants that have anticholinergic effects • Impaired sweating – increased with SNRIs and SSRIs, decreased with TCAs • Sedation and cognitive impairment: reduced alertness, judgement and perception of hot weather 	<ul style="list-style-type: none"> • Hypotension and reduced cardiac output associated with TCAs: may increase risk of fainting and falls • SSRIs commonly associated with hyponatraemia include sertraline, fluoxetine, paroxetine and citalopram.^{27, 28} • Venlafaxine may also contribute to hyponatraemia.^{27, 28}
<p>Anti-convulsants</p> <ul style="list-style-type: none"> ➤ For example pregabalin, gabapentin and sodium valproate 	<ul style="list-style-type: none"> • Sedation and cognitive impairment: reduced alertness, judgement and perception of hot weather 	<ul style="list-style-type: none"> • Ataxia, impaired balance, dizziness and blurred vision, especially on initiation/ increase in dose: increased risk of fainting and falls.
<p>Antipsychotics (typical and atypical)</p> <ul style="list-style-type: none"> ➤ For example risperidone, olanzapine, quetiapine and haloperidol 	<ul style="list-style-type: none"> • Impaired sweating • Altered central thermoregulation • Hypotension & reduced cardiac output: may increase risk of fainting & falls 	<ul style="list-style-type: none"> • Sedation and cognitive impairment: reduced alertness, judgement and perception of hot weather
<p>Medicines with anticholinergic effects</p> <ul style="list-style-type: none"> ➤ For individual medicines see Module 39: The anticholinergic burden at: www.veteransmates.net.au/TB_anticholinergic 	<ul style="list-style-type: none"> • Altered central thermoregulation • Sedation and cognitive impairment • Impaired sweating 	<ul style="list-style-type: none"> • Hypotension and reduced cardiac output: may increase risk of fainting and falls • Dizziness
<p>Diuretics, ACE inhibitors, ARBs and other medicines for hypertension</p>	<ul style="list-style-type: none"> • Hypovolaemia • Postural hypotension: increased risk of fainting or falls • Reduced thirst sensation • Renal impairment – increases risk of hyperkalaemia 	<ul style="list-style-type: none"> • Dehydration (diuretics and ACE inhibitors reduce the effects of sodium retention), causing: <ul style="list-style-type: none"> » reduced visceral blood flow to the liver and kidneys » reduced clearance of medicines and toxins » electrolyte imbalances, including hyponatremia (commonly associated with indapamide, hydrochlorothiazide and frusemide)^{27, 28}
<p>Benzodiazepines and opioids</p>	<ul style="list-style-type: none"> • Sedation and cognitive impairment: reduced alertness, judgement and perception of hot weather 	<ul style="list-style-type: none"> • Increased risk of falls
<p>Other medicines</p> <ul style="list-style-type: none"> ➤ Novel oral anticoagulants (including dabigatran, rivaroxaban & apixaban), oxycodone, morphine, gliptins & metformin, lithium & digoxin 	<ul style="list-style-type: none"> • In dehydrated patients, drug toxicity may result from reduced renal clearance of medicines 	

Note: Quantifying the risk of heat-related morbidity or mortality attributable to individual medicines is difficult,¹³ consider all risk factors (see Table 1) when making decisions about your patients' medicines.



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