Supporting comfort and wellbeing of people who wear personal protective equipment (PPE)

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Purpose

This resource has been developed to provide information and advice to support the comfort and wellbeing of staff who wear personal protective equipment (PPE). It covers prevention of damage to skin from wearing PPE, guidance to support wellbeing and prevent injury and illness from heat stress, and for clinical staff, it expands on the previous Queensland Health Facial Injury and Respiratory Protective Equipment Guidance (2022). (1)

The guidance to support wellbeing and prevent injury and illness from heat stress is particularly relevant when extended use of PPE is required during a pandemic, or when PPE is worn in environments where temperature cannot be easily controlled.

Pandemic: will preface any information that would only be considered during an extraordinary time.

Scope

This resource can be applied to all Queensland Health healthcare settings and situations where PPE is worn. It is designed to inform local policies and to support local decision making in conjunction with a risk management framework. The resource incorporates reasonable and proactive precautionary measures.

Pandemic: Where extended use of PPE is referred to in this resource, the context is a pandemic, and it is referring to the use of PPE for more than four hours in a clinical setting or using the same PPE for multiple patients.

Generally, extended use of PPE is not recommended in a clinical setting*. Extended use of PPE can increase the risk of:*

- *cross infection for patients and healthcare workers*
- *environmental contamination.*

Any decision to allow extended use of PPE in a clinical space is to be made in consultation with the infection prevention and control service. This decision will be during extraordinary circumstances, dependent on the context (pandemic), cohort (outbreak setting) and identified risks.

Background

PPE is worn for a clinical and non-clinical reasons in health care systems and there is a risk of skin injury, heat stress, and a decrease in comfort and wellbeing. This risk may increase when PPE is required for extended use or when used within settings that have a lack of ambient temperature control, decreased air flow or increased humidity. It has been identified that staff may be affected by dehydration, heat stress, pressure injuries, and a decrease in mental and physical performance and wellbeing. (2–6)

Other factors that may contribute to a decrease in comfort and wellbeing for people who wear PPE include:

- Medical conditions, perimenopause and physical fitness that can affect a person's comfort, wellbeing, and thermoregulation whilst using PPE.

- Adequate hydration whilst wearing PPE due to contamination concerns and staff reluctance to hydrate regularly and then needing to use facilities.
- The increasing effects of climate change that are resulting in more extreme weather events.
- Working with High Consequence Infectious Disease, outdoor testing facilities, out of hospital care, within settings that have a lack of environmental control, and during pandemics where extended use of PPE may be required.

Pandemic: When extended use of PPE is being considered in a clinical setting:

- A risk assessment must be undertaken and any decision to allow extended use of PPE is to be made in consultation with the infection prevention and control service. (7)
- Part of the risk assessment for extended use of PPE will be that care is provided for a cohort of patients with the same infectious disease and no other infectious disease.
- It may be accepted that PPE that protects the face and head remain in place while providing care to multiple patients in the same clinical environment.
- P2/N95 respirators and surgical masks can be worn for up to 4 hours continuously without being removed unless damaged, soiled, or contaminated.
- At a minimum, gloves must be changed between patients and when contaminated.
- Aprons and gowns can only be worn between patients if there is limited contact, e.g., collection of meal trays. (8)
- Hand hygiene must always be performed in between changing gloves and/or gowns/aprons.
- PPE should always be doffed when leaving each clinical area.
- Duration of use of PPE items should not exceed the manufacturer's instructions.

Responsibilities

Responsibility of the employer with P2/N95 respirators

- Ensure fit testing is undertaken for workers requiring respiratory protection as per the Queensland Health Fit testing of particulate filter respirators in respiratory protection programs.
- Ensure workers are provided with appropriate education and training in the use of PPE, including undertaking fit checking, as well as in the prevention of facial injuries when required to wear respirators and other PPE.
- Appropriately monitor workers wearing PPE for correct use and for injury.
- Take immediate action if workers report discomfort or skin injuries arising from PPE use.

Responsibility of the wearer with P2/N95 respirators

- Fit check the P2/N95 respirator each time it is applied. When there is prolonged use of a P2/N95 respirator, perform repeat fit checks throughout the course of wear time/work shift with appropriate hand hygiene.
- Use a P2/N95 respirator that you have been successfully fit tested for.
- Immediately report and document discomfort or skin injury arising from PPE to their supervisor and follow any workplace injury process that is in place for their facility.
- Seek a medical assessment and appropriate specialist referral if required (e.g. to a dermatologist) if irritation or allergic reaction to wearing PPE is suspected.
- Access fit testing if you have had a change to your facial shape, such as significant weight loss/gain, trauma or surgery as this may affect the mask fit.
- Use PPE in accordance with manufacturer's recommendations.
- Follow Queensland Health policies and guidelines related to the use of PPE.

Skin - Guidance to prevent injury

P2/N95 masks may cause injury or discomfort due to the requirement for a firm fit. Skin is a natural barrier to infection and pressure injuries can result in discomfort, pain, distress, and can become a carrier of infection that increases the person's susceptibility to infection. (9,10) This discomfort can also result in the healthcare worker touching their face more often, thereby increasing the risk of self-contamination. (10)

Staff may need to be educated and supported to wear PPE properly and maintain skin health inside and outside of the workplace, including nutrition, hydration, and general skin care products.

There are three primary factors that can both influence and impact prevention of these types of pressure injuries:

- Intensity of pressure (and shear).
- Duration of pressure (and shear).
- Tissue tolerance of the individual (including the effects of friction and moisture on tissue tolerance).

When skin is at risk of injury or has been injured, there are two recommendations: (9)

1. Adequate skin care before and after the use of PPE.
2. Use of dressing material as an interface between the PPE and the skin in the areas of adhesion/pressure/friction.

1. Skin care (1,11)

Before shift:

Keep your facial skin care regime **simple**.

- Hydrate skin by drinking water regularly.
- Avoid wearing makeup.
- Moisturise regularly.
- Simple formulations are best with least ingredients. Avoid fragranced products.
- Start with a less greasy lotion before progressing to a greasier cream if tolerated. Depending on your skin type: oily skin/hot weather (gel based), normal or combination skin (lotion based), dry skin (cream based).
- The most important measure for caring for your facial skin is appropriate sun protection. Sunscreens can function as a moisturiser, so you don't have to double up.
- Use a mild skin cleanser (or soap substitute) or micellar water (skincare product that acts as a cleanser) at the beginning and end of the day.
- Avoid toners, which can dry out the skin.
- Skin care products that contain glycolic acids or retinoids can be very irritating, especially when the skin barrier is damaged or compromised and should be avoided.
- Skin care regimes may need to be altered to account for changes to skin for increased humidity under PPE.

During shift:

Choice of P2/N95 respirator or mask:

- Always use hand sanitiser before applying and after removing mask and dispose as per waste management protocols.
- Use a P2/N95 respirator that you have been successfully fit tested for.
- Take time to fit check your mask.
- Do not overtighten.
- Avoid touching your respirator, it may be contaminated by pathogens.

Reduce friction

- If this is a problem, apply moisturising lotion at least 30 minutes before mask wearing to lubricate and reduce friction between the skin and mask.
- Barrier creams can also be used if wearing masks for an extended length of time, however these products tend to be greasy which may aggravate acne. Choose a lighter silicone-based product and check manufacturer instructions. *Use of any compound (e.g., petroleum or mineral oil) that could enhance slippage and affect the function of the PPE is not recommended.* (10)

Regular breaks

- Try and minimise time wearing mask as much as possible and reduce pressure as often as possible.
- As appropriate, take breaks outside of the clinical zone to remove masks completely.
- **PANDEMIC:** In some cases, using a risk assessment, it may be appropriate to lift the mask for five minutes every two hours (with clean hands and in a low-risk area). (10) Always perform hand hygiene after touching the mask.

After shift:

Skin care includes:

- moisturising, especially at night if your skin feels irritated.
- inspecting skin for signs of damage - regularly inspect your skin for signs of redness/scaling.

Pressure injuries:

- Pressure from the respirator can cause skin indentation.
- Most indentation will resolve spontaneously.
- Use of a thin hydrocolloid dressing may help protect the skin if they do not interfere with the respirator seal, e.g. Duoderm (see below: 2. Dressings)
- Apply compresses with three to four layers of gauze soaked in cold water/normal saline applied to the skin for around 20 minutes every 2-3 hours.
- With severe indentation or broken skin, medical attention is advised for individual treatment.
- Avoid using hot water, ethanol or other irritants.
- If pressure from goggles is the main problem, consider switching to a visor.
- Consider treating abrasions with topical moisturisers, lighter silicone-based product, or liquid skin protectants/sealants.
- Staff who develop a pressure injury may either need to be trialled with a different type, or brand of, PPE, including fit testing for different P2/N95 respirators. It may be necessary to redeploy staff to a different area which does not necessitate prolonged use of PPE.
- When there is difficulty managing pressure-related skin injury, further options will need to be discussed with the line manager, an infection prevention and control consultant, an occupational health medical practitioner, general practitioner or dermatologist.

Itchy skin:

- may be caused by skin conditions or friction from masks.

- dry skin is itchy skin - treat dry skin.
- oral antihistamines may need to be trialled, and medical opinion should be sought.

Pressure urticaria:

- rarely, urticaria may be caused by pressure from masks, particularly in people with underlying dermographism (where there is histamine release causing skin whealing in response to light pressure).
- avoid tying masks too tight.
- try different types or brands of masks which fit your face better.
- antihistamines may be of assistance and medical opinion should be sought.

There are few chemicals in masks, and reactions are more likely to be from irritation rather than an allergy. (8)

Areas that may contribute to a reaction are:

- the glue strip across the nose.
- the nose bridge that has a metal wire to mould the mask.
- where the mask touches the cheeks. (8)

2. Dressings

Pandemic: Under normal circumstances, if skin is injured, the person should follow local processes and be fit tested with different PPE to find a product that does not cause injury. The information below includes pragmatic considerations that may be useful during a pandemic.

- dressings may change the fit of respirators and so, appropriate fit testing and frequent fit checking should occur (12)
- if dressings are used, consistency of size, shape and placement are important so it does not interfere with respirator seals.
- certain respirators may be compatible with certain types of dressings.

For more information, please read the See the Queensland Health Facial Injury and Respiratory Protective Equipment Guidance (1)

Heat Stress – Guidance to prevent injury/illness

The risk of heat stress can vary between people, and risk factors include heat acclimatisation, thermal tolerance, fitness, environmental conditions, workload, risk factors and the type of PPE worn.

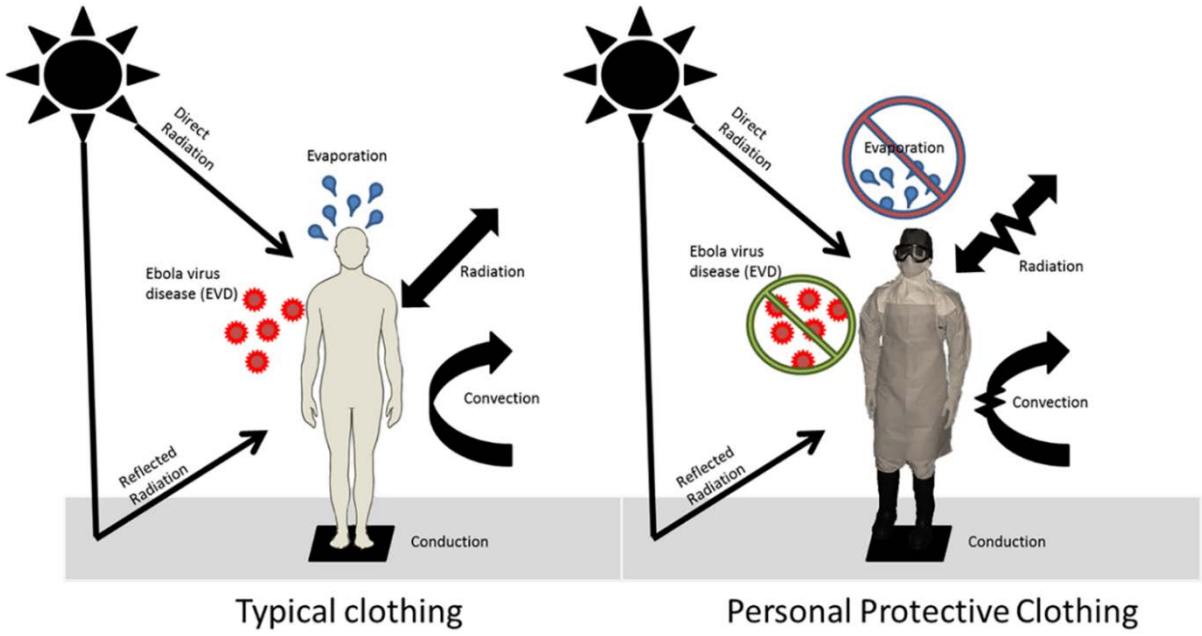
Heat can cause serious illness, including heat exhaustion and heat stroke.

Individual factors that need to be considered when assessing risk and identifying suitable controls include:

- age
- physical health
- pregnancy
- peri/menopause
- working conditions (including work rate and environmental conditions)

- alcohol use
- medications
- extreme weather events
- public health emergencies and sustained use of PPE
- pre work hydration
- access and ability to rehydrate, cool down, rest, and have toilet breaks.

PPE is generally made from fluid resistant materials and can affect the body's ability to maintain a comfortable body temperature. Ideally, the production of sweat allows moisture to evaporate and then cool the body. This can be inhibited by clothing and PPE, affecting heat exchange and increasing risk of heat stress. (13–17)



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Reported symptoms of heat stress from healthcare workers whilst wearing PPE include:

- thermal discomfort (feeling very hot)
- sweating
- thirst
- headache
- fatigue
- slower work performance
- dizziness
- shortness of breath
- decrease in concentration. (15)

Additionally, these symptoms can increase the risk of self-contamination whilst doffing. Sweating may increase the moisture in masks resulting in them needing to be changed more often.

What is heat stress, heat strain and heat hangovers?

Heat stress is when the body is unable to cool itself fast enough to maintain a safe internal (core) temperature of around 37 degrees Celsius. (18) The body can be put under strain when the core temperature rises above this. (18)

Heat strain is the body's overall response resulting from heat stress. These responses are focused on removing excess heat from the body and include increased heart rate, sweating and rise in core body temperature. (19)

Heat hangovers refer to physiological and psychological side effects that may be seen when people are repeatedly exposed to moderate-high heat conditions for prolonged periods of time. Heat hangovers can occur without necessarily having a high core body temperature.

These side effects include:

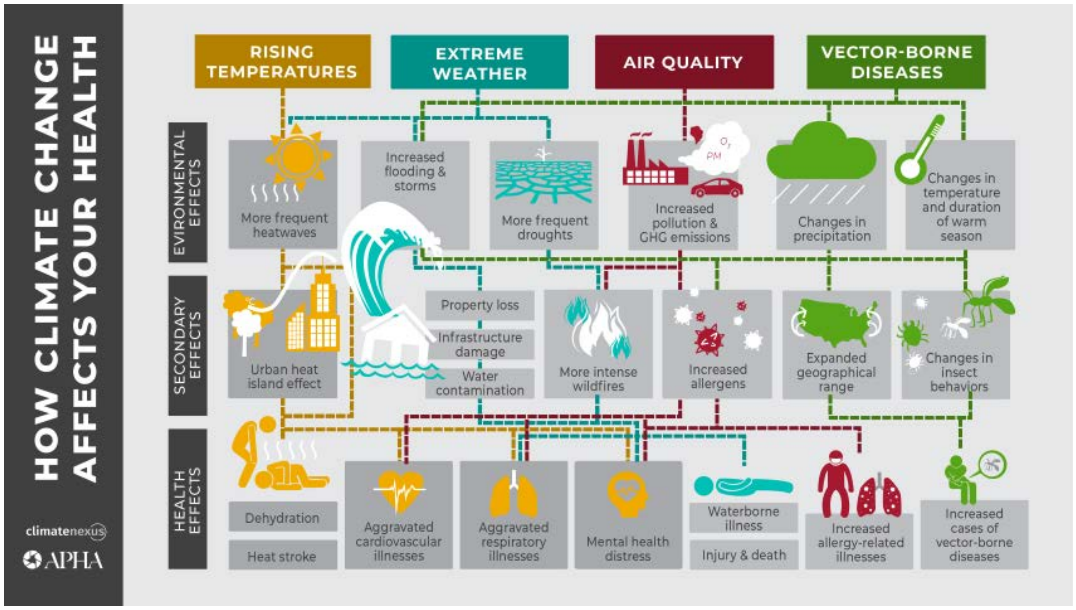
- irritability
- headaches
- nausea
- loss of appetite
- general lethargy towards the end, or following, shift. (18)

Climate change

The six warmest years have all been since 2015. (14) Climate change is one factor that increases the risk for future pandemics, as well as the aging of the global population, population growth and mobility and environmental degradation from issues such as pollution. (20)

Impacts on health include:

- increase in weather events resulting in death and illness
- increase in zoonoses and food, water and vector-borne diseases
- mental health issues. (21)



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Menopause

People who are experiencing peri/menopause can become less tolerant of workplace temperatures and wearing PPE can cause discomfort. Adjustments that should be considered include:

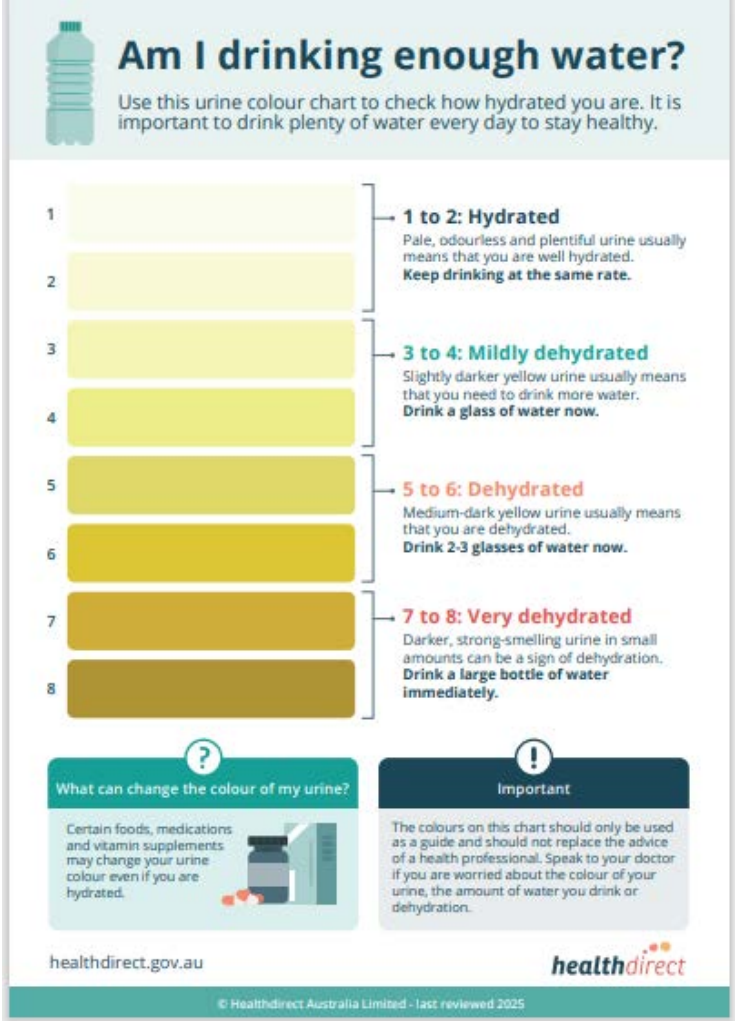
- limiting the time PPE is worn.
- ensuring easy access to water and washroom facilities.
- looking for ways to cool their environment. (23)

These considerations help foster an open, supportive, and inclusive culture for those affected to seek support.

Hydration

Wearing PPE can restrict the ability to rehydrate adequately or create the need to urinate more frequently if staying hydrated. (24) A urine colour chart is a simple and non-invasive way to indicate how well hydrated a person is, keeping in mind that certain foods, medications, and vitamin supplements can change the colour of your urine.

It is important to note that dehydration can exacerbate the effects of heat stress, but a well hydrated person can still overheat.



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Reducing heat stress (2,3,6,26)

Organisations can support staff by:

- educating all staff and supervisors to identity symptoms of heat-related stress and illness.
- encourage staff to speak up for themselves and others when they identify a risk of heat-related stress or illness in themselves or others.
- supplying PPE that is less likely to lead to heat stress.
- reducing staff shifts or episodes of care in PPE.

- using a PPE spotter or buddy system who may provide support, feedback, observation and assistance.
- considering staff access to cooling solutions (see – link to ‘cooling solutions’ below).

Individuals can reduce heat stress in three ways:

1. Start cool.
2. Reduce rises in body core temperature at work.
3. Improve thermal tolerance. (13)

Start cool:

- ensure you are hydrated before starting your shift and avoid chronic dehydration – check the colour of your urine, drink plenty of water, avoid alcohol (due to diuretic effects) and have had adequate rest. (24)
- some people feel increased thermal comfort after drinking cold fluids.

Reducing raises in body core temperature at work:

- recognise and act on signs of heat stress in yourself and others.
- act on signs of dehydration; feeling thirsty, dark or strong-smelling urine (see urine colour chart), decrease in urination, dry mouth, dizziness and fatigue.
- hydrate and eat regularly to ensure electrolyte balance, especially when working for prolonged periods of time and sweating heavily.
- wear appropriate clothing under PPE, reducing layers that add heat.
- reduce heat from exertion – be mindful of your pace, efficiency of movement, and how much equipment you carry.
- between shifts/patient care episodes, take time to rest, cool down, recover, and rehydrate.
- consider cooling devices as appropriate (see cooling solutions below).

Improve thermal tolerance:

- recognise, and act on, symptoms of heat related illness in yourself and others.
- be aware of your risk factors.
- maintain and improve your aerobic fitness as appropriate. Body core temperature tolerance is higher in people who have levels of aerobic fitness and aerobic fitness is also a factor in limiting age related decline in heat tolerance.

Cooling solutions

The cooling solutions below offer points to consider and adapt to the context and environment in which people are working.

Temperature controlled rooms:

- are likely to limit heat stress for people wearing PPE, but
- there is also a balance of patient needs. (24)

Cooling oasis:

- can be used during breaks to cool down once PPE is doffed.
- when outside, shade from trees and umbrellas can be used.
- when inside, the use of air conditioners and fans can be used where appropriate (forced convection cooling).
- where appropriate, fans with water misting can be effective for evaporative cooling.

- availability of cool drinks, including ice slurries to rehydrate, increase comfort, and actively cool down.
- availability of food and liquids that replenish and balance electrolytes.
- active cooling is an effective way to reduce heat strain with a combination of external cooling (e.g., cooling vests) and internal cooling such as cool drinks or ice slurries. (2,5,17,24)

Reduce time spent in PPE:

- sharing patient care to limit time in PPE as appropriate.
- reduction of shift time or an increase in rest periods. (17,24)
- powered air purifying respirators (PAPRs) can be cooler to wear if they are available and approved to use in healthcare.

Cooling garments (e.g., vests, ties, caps, and neck wraps). It may be useful to use vests during a cool down rest period rather than during patient care as:

- ice vests effects have often been assessed for <1 hr so once the vests warm up, they will not be actively cooling the person and could then add weight, thereby increasing discomfort and possibly increasing metabolic heat production.
- depending on the length of time the vests are worn, they may require changing, increasing time spent donning and doffing PPE, and may require more supervision across a group of workers.
- vests worn over PPE are then considered contaminated and will have to be decontaminated each time.
- effectiveness of vests worn over clothes will also depend on the permeability of the clothing.
- it may be difficult to store vests in certain environments and could be more easily stored in rest areas for active cooling. (24)
- effectiveness of evaporative cooling products will depend on the humidity of the environment and the extent of surface area in contact with them
- ice or chilled water-cooled garments may result in vasoconstriction, reducing the cooling effect of the garment, although individuals may have a subjective ‘feel good’ effect from wearing garments, such as neck cooling collars. (19)

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