Heat Health

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CDC's website is being modified to comply with President Trump's Executive Orders.

Clinical Overview of Heat and Children and Teens with Asthma

KEY POINTS

- Heat can worsen asthma symptoms. Encourage children and teens with asthma to check the HeatRisk forecast daily during warm months.
- There are several ways to stay healthy when it's hot outside. Create a Heat Action Plan with your patients and/or caregivers of children and teens.
- Provide guidance to children and teens with asthma on the signs of overheating, such as difficulty breathing and more fatigue than usual with exercise.
- Ask patients and/or caregivers of children and teens with asthma to also check the air quality index (AQI) daily and take protective action when the AQI is >100, since hot days can worsen air quality, and breathing air with unhealthy ozone levels for as short as 1 day can trigger asthma attacks.
- Review medications taken by children and teens with asthma for their potential to increase heat sensitivity. Make a plan to avoid medication complications during hot days, including keeping asthma inhalers out of hot cars and other hot places, since they can burst from high heat.

Background

While this heat guidance is for children with asthma and their caregivers, all children have unique sensitivities to heat exposure. Children's developing minds and bodies may be more sensitive to higher temperatures than adults. Children may spend more time outdoors, have less control over their physical environments, less knowledge about the health effects of heat, and less ability to remove themselves from harm. Heat exposure can impair learning and physical development, compromise mental health, and worsen asthma comorbidities in children.

This guidance document is intended to help support your conversations with children, teens, and their caregivers on the impact of heat on asthma. The information provided can empower them to take protective actions on hot days. While not every child or caregiver may be able to take all actions, each action can help children or teens with asthma stay healthy during hot days.

Balancing outdoor time with staying safe from the heat

Being outside can provide many benefits to children's health. Hot weather, however, can create conditions that can harm children's health, especially because children have unique sensitivities to heat exposure. Children's developing minds and bodies may be more sensitive to higher temperatures than adults. Children may spend more time outdoors, have less control over their physical environments, less knowledge about the health effects of heat, and less ability to remove themselves from harm. Heat exposure can impair learning and physical development, compromise mental health, and worsen asthma comorbidities in children.

Risk factors

Heat, air quality, and asthma

Hot days can both directly and indirectly increase risk to asthma patients.

Hot days may contribute directly to asthma attacks through dehydration. Dehydration, and associated lactic acidosis and electrolyte imbalance, can result in more severe asthma symptoms.

Hot weather can increase levels of air pollutants, including ozone, fine particulate matter, and sulfur dioxide. These pollutants can trigger asthma attacks and increase the need for medical care. For example, heat fuels the creation of ground level ozone, or smog, formation. In addition, hot days can be humid, and humidity can worsen lung function.

Pollen is another common trigger for asthma. Over the past several decades, the pollen season has lengthened by several weeks in many regions of the United States.

Hot and dry weather can increase the risk of wildfires. Wildfire smoke pollutants provoke asthma symptoms. During the heat season, exposure to multiple concurrent environmental hazards, including wildfire smoke, pollen, and flooding that can lead to mold, can result in children facing several simultaneous asthma triggers.

Children with asthma and special health care needs, including children with compromised lung function and other co-morbidities, such as obesity, may be more susceptible to harm from heat exposure and air pollution. For these children, a discussion about chronic condition management should include guidance on managing heat and air pollution risks while still achieving physical activity recommendations.

Children and teens with asthma may benefit from including steps to reduce heat and poor air quality exposure in both their Heat Action Plan and their Asthma Action Plan.

Heat, medications, and asthma

Medications that treat asthma and other health conditions can interact with heat. Many medications, including over the counter medications, can impair heat tolerance and the body's ability to regulate its temperature. This can predispose people to heat illness during hot days.

Medications, such as some antihistamines, can decrease the body's ability to sweat, and therefore to cool itself. Some medications can cause electrolyte and fluid imbalance as well as dehydration. Some medications used to treat Attention Deficit/Hyperactivity Disorder (ADHD) like methylphenidate directly increase body temperature, increasing heat intolerance. Dehydration can reduce kidney blood flow, resulting in kidney injury from nephrotoxic drugs such as non-steroidal anti-inflammatory drugs (NSAIDs). Dehydration can also increase blood levels of medications which may result in adverse events. Heat-induced poor air quality may increase medication needs in children with asthma. Lastly, many medications, including certain antibiotics, can increase sensitivity of the skin to the sun.

Proper storage of medications during hot days is important since heat exposure may directly compromise medications and medication delivery devices. For example, in temperatures above 120° F, which can occur inside a car trunk on a hot day, metered dose inhalers can burst. EpiPens may malfunction or deliver less epinephrine when exposed to heat. Insulin, which should always be stored in a refrigerator, may become less effective if left in the heat.

Medication regimens, including those listed in your patient's Asthma Action Plan, should be carefully reviewed with attention to those that may affect heat tolerance or fluid balance. A plan should be made for any necessary medication changes to maintain asthma control on days with heat and poor air quality. The Heat and Medications page provides more information on medications and heat that can inform patient guidance.

Patient management

Take these 5 steps to help patients and/or caregivers of children and teens with asthma stay safe on hot days and document them in a Heat Action Plan with your patients.

1. **Assess risk factors that may make heat or poor air quality more likely to worsen your patient's asthma control.**
    - **Ask about baseline control of asthma** since children with poorly controlled asthma may be more sensitive to heat and poor air quality.
    - **Use the CHILL'D-OUT questionnaire** to do a risk factor assessment. If your time is limited, ask the questions in bold.
        - **C – Cooling**
            - **Does your patient have working air conditioning?**
            - Can they check and control indoor temperatures where they live?
            - Do they have an electric fan?
            - Do they know how to locate a cooling center if needed?
        - **H – Housing**
            - **Does your patient have stable housing?**
            - Do they live on a higher floor of a multi-story building where they may be exposed to more heat?
            - Are they regularly exposed to indoor air pollutants such as secondhand smoke or mold?
            - Do they have a portable air purifier or a filter in their HVAC system?
        - **I – Isolation and mobility**
            - **Does your patient have a neighbor, friend, or family member who can check on them during hot days?**
            - Does their mobility limit their ability to seek cooling in their home or elsewhere?

- **L – eLectricity**
  - **If heat leads to a power outage,** does your patient have a plan for refrigerated medications and/or electric medical devices, such as nebulizer machines, ventilators, or oxygen concentrators?
- **L – Learning**
  - **Does your patient check the daily and hourly weather forecast to know the hottest time of the day? Can they access the HeatRisk tool?**
  - Where does your patient get information about how to protect their health from heat and what measures do they take to do so?
- **D – Drugs**
  - **Does your patient take medications that increase risk from heat exposure?**
- **Out – outside**
  - **How much time does your patient spend outdoors on hot days for work, sports, or recreation?**
  - Are they exposed to outdoor air pollution at home, work, or elsewhere, such as a major roadway, construction site, industrial facility, or frequent wildfire smoke?
  - Do they have allergies to grass, weeds, and tree pollens?

2. **Educate your patients on how to stay cool during hot days.**

- Review the HeatRisk Tool with your patients and/or caregivers of children and teens which outlines how commonly each color HeatRisk level may occur and provides suggested actions people can take at each color level.
- Most patients can take action beginning when the HeatRisk is **orange**.
  - Some children with asthma will be sensitive to heat when HeatRisk is **yellow** and will need to take action at the yellow level. Ask your patients and/or their caregivers to monitor their symptoms at HeatRisk yellow and orange and let you know if this applies to them.
- Review the signs of heat-related illness and signs of worsening asthma with your patients and their caregivers. Heat symptoms include heavy sweating, muscle cramps, weakness, light headedness, headache, nausea, and vomiting. Develop a plan with them for when to seek medical care.
- Advise your patients and/or caregivers of children and teens on how to stay cool outdoors at each level of the HeatRisk tool. In addition, when outside, everyone can:
  - Wear light, loose-fitting clothing that covers arms and legs, a hat with a brim that shades the face, ears, and back of the neck, and sunglasses.
  - Apply broad spectrum sunscreen that filters out UVA and UVB rays. The sunscreen should have an SPF of 30 or higher.
- Remind your patient and/or caregivers of children and teens to try to schedule their activities during the coolest time of the day or evening, if possible.
- Talk to your patients and/or caregivers of children and teens about how to stay cool indoors. They can:
  - Use an air conditioner if they have one or find a location that does. Even a few hours in a cool location can lower the risk for health problems from heat.
  - Use fans, but only if indoor temperatures are less than 90°F. In temperatures above 90°F, a fan can increase body temperature.
- Refer patients and/or caregivers of children and teens who need assistance with home energy costs to the Low-Income Heat Energy Assistance Program (LIHEAP).
- Direct your patients and/or caregivers of children and teens to information about public resources such as cooling centers, pools, and splash pads. The nearest cooling center locations can be located by calling 2-1-1, checking public resources, and/or contacting your local health department and emergency management agency.

3. Educate your patient on how to stay hydrated.

- Review signs and symptoms of dehydration, which include:

Cold, clammy skin	Nausea
Dizziness or feeling lightheaded	Abdominal cramping
Rapid heart rate	Swelling in extremities
Excessive sweating or an inability to sweat	Darker color urine

Fatigue	Infrequent urination
Headache	Thirst
Muscle cramps or spasms	

- Emphasize the importance of regular and consistent fluid and food intake throughout the day.
- Advise patients and/or caregivers of children and teens to consider limiting beverages higher in sugars, sodium, and caffeine, if possible, which may lead to dehydration. See Guideline 4 of the dietary guidelines PDF.
- Advise patients that water is usually the best choice, although sports drinks containing balanced electrolytes may be helpful if sweating for several hours.

4. **Educate your patient on air quality**, as heat worsens air quality which impacts their health.
    - Review the Air Quality Index (AQI) with your patients and/or caregivers of children and teens at HeatRisk Dashboard, the phone's weather app, or at airnow.gov. Ensure they know how to access, understand, and use the information including which action steps they can take based on the specific air quality level.
    - Review indoor air quality measures.
        - **Steps to Take for Good Indoor Air Quality**
            - Remind your patients and/or caregivers of children and teens that indoor air can be as polluted as outdoor air.
            - Educate patients and/or caregivers of children and teens that cigarette and e-cigarette smoke, candles and air fresheners are indoor sources of air pollution.
            - If possible, bring outdoor air in when cooking indoors.
            - Encourage patients to allow clean indoor air inside when the AQI is less than 100 (or <50 for sensitive individuals).
        - **About Air Filters**
            - **Discuss air purifiers, also known as air sanitizers, air cleaners, and/or air filters used in HVAC systems**. While these devices cannot remove all air pollutants, they can improve indoor air quality for many pollutants when used properly. A list of portable cleaners can be found here.
            - Some homes have HVAC systems with replaceable filters. These filters have MERV (Minimum Efficiency Reporting Values) ratings or are designated as HEPA (high efficiency particulate air) filters. To effectively remove indoor air pollution, HEPA filters or filters with MERV of 13 or higher can be used.
            - Air filters should be replaced regularly. Replacement frequency depends on how much air pollution is present but can be done every 60-90 days.
            - Do-it-yourself (DIY) air cleaners may be a more affordable and accessible alternative to commercial versions to filter out smoke particles and can be constructed using a box fan and a high-efficiency home air filter.

Did you know?

About the Air Quality Index (AQI) and Actions to Consider at Each Level
The AQI reports air quality for common air pollutants such as ground-level ozone, particle pollution, carbon monoxide, sulfur dioxide, and nitrogen dioxide. Its value ranges from 1 to 500, with higher numbers corresponding to worse air quality and greater health concerns. When the number is above 100, outdoor air is considered unhealthy for sensitive groups including children with asthma. **On days with an AQI > 100,** it is okay to be outside, **but they can consider taking more breaks and do less intense activities.** They can follow their asthma action plan and keep quick relief medicine handy.
Some children with asthma may be sensitive to air pollution when the AQI is between 51 and 100. Ask your patient to use the AQI to assess whether they have more symptoms when the AQI is between 51 and 100. If so, refer them to actions to take for people sensitive to poor air quality.
Of note, **the Air Quality Index does not include pollen counts**. This means that on some days, the Air Quality Index may be low even though pollen levels in the air are high.

5. **Make a plan for medication management on HeatRisk orange, red, and magenta days.**
    - Counsel your patients and/or caregivers of children and teens to take all medications as directed unless otherwise guided by you or another clinician.

- Review your patient's medication list with them, highlighting medications that may reduce their heat tolerance, such as some antihistamines, or medications that may need to be adjusted because of interactions with higher heat. See the Heat and Medications page for more information.
- Provide guidance on proper medication storage, especially for medications that individuals may carry with them, such as inhalers, which can malfunction or burst from high heat. Counsel your patients and/or caregivers of children and teens not to leave medications in a car or other places that can get excessively hot.
- Counsel your patients and/or caregivers of children and teens to limit sun exposure if they take a medication that can cause sensitivity to the sun, such as certain antibiotics. To avoid sunburn which can promote dehydration, recommend applying sunscreen of SPF 30 or greater, using a sun-protective hat and clothing, and trying to stay indoors during the hottest part of the day.
- Plan for what to do in the event of a power outage for medications requiring refrigeration like insulin, for medication delivery devices like nebulizer machines, and for electrical medical devices, like ventilators and oxygen concentrators.

SOURCES

CONTENT SOURCE:
National Center for Environmental Health (NCEH)