Child Vehicular Heatstroke:

An Under-Recognized Risk to Child Passenger Safety
Objectives

- Provide a brief overview of heat-related illness
  - Definitions
  - Risk Factors
  - Thermoregulation
- Discuss treatment strategies
- Examine causes of child vehicular heatstroke
- Review available resources for prevention
Overview: Heat-Related Illness

- A spectrum of symptoms due to excessive heat exposure
  - Ranges from mild to fatal:

  **MILD**
  - Heat Exhaustion
  - Heat Cramps

  **FATAL**
  - Heatstroke
  - Exertional
    - NON-Exertional (eg: vehicular)

### Heat-Related Illness (cont.)

- **Key initial physical sign to distinguish mild illness vs. heatstroke:**
  - **Core temperature:**
    - <104°F: mild heat illness
    - ≥104°F: heatstroke

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**Becker J. Am Fam Physician 2011; 83(11):1325-30.**
Thermoregulation

- The body’s methods to maintain a healthy temperature
  - Conduction
    - Direct transfer of heat from a warmer surface to a cooler surface
  - Evaporation
    - Perspiration
  - Radiation
    - Absorption or reflection of heat without direct contact
    - Eg: reflection of heat with light-colored clothing
  - Convection
    - Exchange of heat with surrounding air

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<thead>
<tr>
<th>Risk Factors</th>
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<tr>
<td><strong>Age</strong></td>
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<td>- Young children—especially &lt;4 years</td>
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<td>- Elderly</td>
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<td><strong>Cognitive impairment/mental illness</strong></td>
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<td><strong>Heart and lung diseases</strong></td>
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<td><strong>Obesity</strong></td>
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<td><strong>Impaired mobility</strong></td>
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<td><strong>Poor fitness level</strong></td>
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<td><strong>Sickle cell trait</strong></td>
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<td><strong>Strenuous outdoor activity during hottest daytime hours</strong></td>
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<td><strong>Urban residence living/higher floor residence</strong></td>
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<td><strong>Limited access to air conditioning</strong></td>
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<td><strong>DRUGS!</strong></td>
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Heatstroke

- Also known as “hyperthermia”
- Body temperature exceeds 104°F
  - + Body’s thermoregulatory mechanism is overwhelmed and can no longer cool itself
  - + Symptoms:
    - Central nervous system effects: disorientation, sluggishness, hallucinations, seizure, loss of consciousness
    - Other: hot/dry skin that is flushed but not sweaty, rapid heart rate, other heart rhythm disturbances
- Body temperature >107°F: organs shut down, cellular damage
  - Fatal if not rapidly reversed

Treatment

1. CALL 911 AND remove child from hot environment
2. Ensure airway stability (ABC)/ CPR if needed
   - Airway
   - Breathing
   - Circulation
3. Rectal temperature assessment (if available)
4. Initiate rapid cooling
   - Treatment of choice= cold water immersion
   - Remember to remove excess clothing
5. Intravenous hydration if/ when available
6. Transport to ER
Rapid Cooling Techniques

- **Cold water immersion**
  - Gold standard; associated with lowest morbidity and mortality rates

- **Ice pack/ wet towel application**
  - Head/ neck, axilla, groin

- **Evaporative and convective cooling**
  - Rapid air movement with fan while spraying mist of water on body
  - Most common method used
Child Vehicular Heatstroke

- Children are more prone to overheating than adults:
  - Immature thermoregulatory system: less efficient than adults
    - A child’s body overheats 3-5 times faster than an adult body
  - Adults more likely to modify behavior based on environment (eg: remove excess clothing, get out of a hot car)

Child Deaths Due to Vehicular Heatstroke: Why Are We Talking About It?

Vehicular Heatstroke: 3rd leading cause of death!

Child Vehicular Heatstroke: Understanding the Cause

Data from 494 child hot car deaths (1998 – 2010)

• More than 1 in 5 heatstroke DEATHS
• Kids were supposed to go to DAYCARE that morning
• FORGOTTEN in the backseat instead
• Whereabouts went unquestioned

Children Left in Vehicles: How Hot? How Fast?

- Rate of temperature rise in first 20 minutes: 6.25°F/5 minutes
  - Overall rate of temperature rise through 60 minute study: 3.1°F/5 minutes
- 80% of temperature rise in first 30 minutes
  - Temperature rise begins within five minutes of shutting off ignition
  - Temperature begins to plateau at 60 minutes

How Hot?  How Fast? (cont.)

Car Simulation
http://www.youtube.com/watch?v=b3NFfWlfj24&feature=player_embedded

Statistics

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<tbody>
<tr>
<td>Deaths 2012</td>
<td>5+</td>
</tr>
<tr>
<td>Deaths 2011</td>
<td>33+</td>
</tr>
<tr>
<td>Deaths 2010</td>
<td>49+</td>
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<tr>
<td>Average # Deaths/ year</td>
<td>38</td>
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<tr>
<td>Deaths 1998 - present</td>
<td>532+</td>
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- No national registry for this cause of death
  - Data derived from media reports
  - Numbers very likely underestimated

- Near misses more common than you think!
  - San Antonio TX Fire/ Rescue 2011:
    - 187 calls to rescue unattended children trapped in cars (April 14 – September 14)
  - Palm Beach Co. FL EMS 2011:
    - 500+ calls to rescue unattended children trapped in cars

Regional Impact

Child Vehicular Hyperthermia Deaths by State 1998-2011


We are #1!!
The Lone Star State

- Leads the nation in child hot car deaths
  - 81+ deaths as of June 2012
  - 60% of children “forgotten” by parent
- Nearly **1 in 3 deaths** due to failure to drop child off at daycare
  - TX Past 5 Years: **37%** of deaths due to failure to drop child off at daycare
  - National data: 1 in 5+ deaths

“How Can ANYONE Forget that a Child is in the Backseat??”

“If you’re capable of FORGETTING your CELLPHONE, you are potentially capable of FORGETTING your CHILD”

David Diamond, Ph.D., USF

The Human Brain

Most advanced memory/thinking components:
- Prefrontal cortex and hippocampus

Primitive component:
- Basal ganglia ("lizard brain")

STRESS weakens the brain’s higher functioning centers
- Overrun by the non-thinking/non-analytical "lizard brain"

Common Factors Associated with Parents Who Forgot their Children

- Stress
- Emotion
- Lack of sleep
- Change of routine

STOP The Madness!

Take ACTION Against Child Hot Car Deaths BEFORE They Occur
Prevention

- NEVER leave a child unattended in a car, not even for a minute!
- Routines and distractions have caused people to mistakenly FORGET children in the backseat
  - Place a cell phone, PDA, purse, briefcase, gym bag or something that is needed at your next stop on the floor in front of a child in a backseat. This triggers adults to see children when they open the rear door and reach for their belongings.
  - Set your cell phone or Blackberry reminder to be sure you dropped your child off at daycare
  - Set your computer calendar program, such as Outlook, to ask, “Did you drop off at daycare today?”
  - Have a plan that if your child is late for daycare that you will be called within a few minutes. Be especially careful if you change your routine for dropping off little kids at day care.

Prevention: Ray Ray’s Pledge

- Targets the more than 1 in 5 child hot car deaths that occur because the child was not dropped off at DAYCARE that morning; FORGOTTEN in the BACKSEAT instead

1. **Parents commit:** to communicate all planned absences to the daycare teacher

2. **Daycare teacher commits:** to call if a child has not arrived by his/her usual arrival time and a planned absence has not already been communicated

- **ONE PHONE CALL CAN SAVE A CHILD’S LIFE!**

- **Take the Pledge ONLINE:**
  - www.rayrayspledge.com
Ray Ray’s Pledge: Taking ACTION Against Heatstroke!

- Ongoing expansion to communities nationwide
  - Numerous sites in 8 states to date
  - Provision of educational and reminder tools
    - Parents and childcare providers
    - Launch of Operation Maya MOO
      - Medical Outreach and Optimization

- Social media and web-based awareness:
  - [www.facebook.com/rayraycavaliero](http://www.facebook.com/rayraycavaliero)
  - [www.rayrayspledge.com](http://www.rayrayspledge.com)

- Partnership with Suddenly Safe ‘N Secure Child Carseat ALARM Systems
  - Provides additional safety net to daily child transport routines

RRP Reminder Tools*

*All reminder tools are available free of charge upon request from www.rayrayspledge.com courtesy of generous sponsors and donations.
SSNSS Child Car Alarms

Child Bracelet and Keychain Receiver

Carseat Alarm (installed) and Keychain Receiver

Carseat Alarm and Keychain Receiver

suddenlysafeseceansystems.com
Educational Resources

Taking ACTION Against Heatstroke!

- http://ggweather.com/heat
- www.safekids.org/nlyca
- www.rayrayspledge.com
- www.suddenlysafefensecuresystems.com
- www.facebook.com/rayraycavaliero
- www.safercar.gov/heatstroke
- www.nws.noaa.gov/os/heat/
- www.youtube.com/watch?v=b3NFfWlfj24&feature=player_embedded
- www.kidsandcars.org/heatstroke.html
Thank You!

Sophia Rayne “Ray Ray” Cavaliero
5.15.10 - 5.25.11

FORGET ME NOT!