CookChildren's

1 **When Too Much Of A Good Thing Turns To Hyponatremia**
And
How To Handle Medical Emergencies Resulting From The Texas Heat

Daniel D Guzman MD

2 **Hyponatremia**

- Objectives
  - How to identify signs/symptoms of hyponatremia
  - How to treat and prevent hyponatremia in athletes
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3 **Hyponatremia**

- Exercise Associated Hyponatremia (EAH)
  - Occurs during or up to 24hr after exercise
  - Serum plasma <135 mmol/L
  - Total content of exchangeable total body sodium/potassium relative to total body water
  - Most cases related to excess total body water
  - 7-10% fall in 24hrs
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4 **Hyponatremia**

- Activities associated with EAH
  - Endurance races
  - Hiking
  - Police/military training
  - Football
  - Bikram yoga
  - Fraternity hazing
  - Lawn bowling
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5 **Hyponatremia**

- Risk factors
  - Overdrinking *
  - Weight gain during exercise
  - >4 hours of exercise duration
  - Inexperience/training
  - Slow pace
  - High/low body mass index
  - Readily available fluids

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6 **Hyponatremia**

- Who is at risk?
  - High school athletes
  - Drink too much before and during exercise
  - Small slow athletes who sweat profusely
  - More time to drink excessively
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7 **Hyponatremia**

- What causes hyponatremia in athletes?
  - SIADH
  - Sequestration of water
  - Overuse of NSAIDS
  - Abnormal Na losses in sweat (excessive drinking)
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8 **Hyponatremia**

- Athletes
  - Hypo-osmolality of plasma
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  - Dilutional hyponatremia
    - More water than substance dissolved in plasma
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9 **Hyponatremia**

- During exercise
  - Urine production decreases (20-60%)
  - Decrease renal blood flow
  - Decrease urine production
  - Kidneys reabsorb Na and water in response to sympathetic response
  - Decrease capacity to excrete urine and leads to increase risk
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10 **Hyponatremia**

- Pathophysiology of EAH
  - Dilutional
  - Acute onset form
  - Sustained overdrinking
  - Vasopressin(AVP) release

- Impaired water clearance
- Increase number of deaths

11 **Hyponatremia**

- Normal Total Body Water and Na
- Increased Total Body Water and Na
- Decreased Total Body Water and Na
- Increased Total Body Water- normal Na

12 **Hyponatremia**

- Dilutional EAH
  - Total body water expansion relative to amount of total body sodium
  - Major cause of asymptomatic and symptomatic
  - 2 major types
    - Euvolemic / Hypervolemic
    - Hypovolemic

13 **Hyponatremia**

- Euvolemic
  - Increase total body water / no change in sodium
- Hypervolemic
  - Increase total body water above increase in sodium
- Primary: more fluids in than out
- Secondary: increase AVP secretion, decreased urine producton

14 **Hyponatremia**

- Sustained decrease Na disrupts osmotic balance
- Influx of water across blood brain barrier
- Results in brain swelling/cerebral edema
- Faster and lower the Na→ increase risk of morbidity mortality

15 **Hyponatremia**

- Best classified by clinical severity
- 3 forms
  - Asymptomatic
  - Mild
  - Severe

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16 **Hyponatremia**
- Asymptomatic
  - Biochemical finding
  - Transient
  - Do not seek medical care
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17 **Hyponatremia**
- Mild
  - Non-specific signs and symptoms
  - Normal vital signs
  - No encephalopathy
  - Symptoms do not resolve in Trendelenburg
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18 **Hyponatremia**
- Mild symptoms
  - Lightheadedness
  - Dizziness
  - Nausea
  - Puffiness
  - Body weight gain
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19 **Hyponatremia**
- Severe hyponatremia
  - Vomiting
  - Headache
  - Altered mental status
    - Confusion, disorientation, agitation, delirium
  - Phantom running
  - Seizure
  - Coma

- Brain herniation
  - Posturing, "big pupils"
- Dyspnea (non-cardiogenic pulmonary edema)
- Frothy sputum (con-cardiogenic pulmonary edema)

20 **Hyponatremia**

- Symptoms associated with sodium values
- [125-135 mmol/L]
  - No symptoms
  - Mild Gastrointestinal – bloating, nausea
- [<125 mmol/L]
  - Headache, vomiting, difficulty breathing, swelling of hands/feet, restlessness, fatigue, confusion, disorientation
- [<120 mmol/L]
  - Seizures, respiratory arrest, coma, death

21 **Hyponatremia**

- How much water does a 300lb lineman lose during a game?

A 0.5 gal
B 1.08 gal
C 1.5 gal
D 2.2 gal

22 **Hyponatremia**

- "Recognize Early!!!"

Overdrinking	Nausea/vomiting
Dizziness	Muscle twitching
Tingling	Swelling
Headache	Disorientation
Altered mental Status	Physical exhaustion
Pulmonary edema	Seizures
Cerebral edema	

23 **Hyponatremia**

- Acute treatment
  - Mild symptoms
    - Restrict fluids (onset of urination)

- Oral or IV fluids appropriate
- Consume salty foods or fluids
- Seek medical attention if neurological symptoms develop
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24 **Hyponatremia**

- Acute treatment
  - Severe symptoms
    - ED evaluation
    - 3% saline/Hypertonic saline (HTS)
      - 100ml bolus x 2 over 20-30 minutes
      - Stop when Na 128-130
      - More risk not giving
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25 **Hyponatremia**

- On-site treatment
  - Remote setting
  - Unable to verify [Na]
  - Clinical evaluation of severe EAH
  - Justified and life-saving
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26 **Hyponatremia**

- Prevention
  - Individualized hydration protocol
    - Drink when "thirsty"
  - Adequate dietary Na with meals
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  - Post exercise rehydration→ correct fluid loss
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  - Body weight changes, urine color and thirst
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27 **Hyponatremia**

- "Drink to minimize dehydration"
- Record body weights before and after

- Replace Na during exercise
- Don't rely on water alone
- Don't overdrink
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28 **Hyponatremia**

Can urine whiten your teeth?

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True or False

29 **Hyponatremia**

- AAP (2000)
  - Child should be well hydrated
  - "Periodic drinking"
  - Every 20min
    - 5oz/150ml -- 40kg
    - 9oz/250ml – 60kg
  - Weigh before and after
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30 **Hyponatremia**

- American Dietetics Assoc (2000)
  - "Drink enough fluid to balance losses"
  - 400-600ml / 14-22oz – 2 hours prior
  - 150-350ml / 6-12oz – every 15-20 minutes
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31 **Hyponatremia**

- National Athletics Training Assoc (2000)
  - Proper pre-exercise hydration
    - 500-600ml / 12-20oz
    - 2-3 hours prior to exercise
  - 200-300ml / 7-10oz every 10-20 min before exercise
  - Fluid replacement
    - Approximate sweat and fluid losses
  - Maintain < 2% body weight loss
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32 **QUESTIONS**

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33 **Heat Illness**

- Objectives
  - Identifying the different states of heat related illnesses
  - Identify the risk factors that predispose the athlete to the spectrum of heat related illnesses
  - On the field treatment of heat related illnesses

34 **Heat Illness**

- Exertional heat stroke
  - PREVENTABLE!!!
  - 3rd leading cause of death in athletes
  - Recognize early and treat quickly
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35 **Heat Illness**

- Spectrum of disease
  - Heat edema
  - Heat rash
  - Heat syncope
  - Heat cramps
  - Heat exhaustion
  - Heat stroke
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36 **Heat Illness**

- Heat edema
  - Mild
  - Dependent soft tissue swelling
  - Peripheral vasodilation
  - Increase hydrostatic pressure → third spacing
  - Usually older adults
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37 **Heat Illness**

- Miliaria rubra
  - Heat rash/prickly heat
  - Pinpoint red papules
  - Pruritic
  - Covered areas – waist, groin, trunk
  - Clogged sweat ducts
  - Risk for secondary Staph infections
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38 **Heat Illness**

- Heat syncope
  - Orthostatic hypotension from peripheral vasodilation and venous pooling
  - Prolonged standing
  - Recover mental state quickly
  - Usually after exercise
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39 **Heat Illness**

- Heat cramps
  - Earliest sign of significant heat illness
  - Increase heat → increase sweating → inadequate fluid replacement
  - Isolated or part of constellation of worsening illness
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40 **Heat Illness**

- Heat exhaustion
  - Body temp 37-40 deg (98-104 F)
  - Symptoms include:

Malaise	Fatigue	Dizziness
Heavy sweating	Nausea	Vomiting
Headache	Fainting	Weakness
Cold/clammy	NORMAL MENTAL STATE	

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41 **Heat Illness**

- Heat stroke
  - Temp > 40 deg (Core)
  - 2 types
    - Classic- environment
    - Exertional- intrinsic
  - Thermoregulatory function to fail – unable to dissipate heat
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42 **Heat Illness**

- Incidence
  - 400 cases per year
  - Most weather related
  - 3rd leading cause in athletes
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43 **Heat Illness**

44 **Heat Illness**

- Heat stress
- Peripheral vasodilatation
- Sweating
- Na loss
- Cardiac response
- Hindered by dehydration and Na loss
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45 **Heat Illness**

- Heat exchange by body to environment
  - Conduction
  - Convection
  - Radiation
  - Evaporation
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46 **Heat Illness**

- Risk factors – Internal

Medications	Age (<15)
Sickle Cell	Poor fitness
Recent febrile illness	Skin conditions
Sleep deprivation	Dehydration
Sun burn	Obesity

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47 **Heat Illness**

- Risk factors – External
  - Temperature
  - Excessive clothing/equipment
  - Humidity
  - Activity level
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48 **Heat Illness**

- Risk factors -Medications
  - Alcohol
  - Anti-histamines
  - Anti-cholinergics
  - Dietary supplements
  - Amphetamines
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- BE AWARE !!!

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49 **Heat Illness**

- Treatment
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  - LOWER CORE BODY TEMPERATURE !!!
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50 **Heat Illness**

- Treatment
  - ABC's
  - Cooler environment
  - Take off the field
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51 **Heat Illness**

- Heat syncope
  - Place in supine position
  - Cooler environment
  - Elevate patient's legs
  - IVF may be necessary
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52 **Heat Illness**

- Heat cramps
  - Stretching
  - Ice
  - Massage
  - Stop activity
  - IVF
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53 **Heat Illness**

- Heat exhaustion
  - Identify early
  - Core temperature
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  - Mild symptoms (normal vital signs)
    - Cool and Remove!
    - Oral Rehydration

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54 **Heat Illness**

- Heat exhaustion
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  - Severe symptoms (Abnormal vital signs)
    - IV fluids
    - Ice bags

55 **Heat Illness**

- Heat stroke
  - Aggressive !!!
  - Longer and higher the temperature → increase in morbidity/mortality
  - Immersion in ice water
  - Evaporative cooling → spray mist
  - Fans
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56 **Heat Illness**

- Field treatment
  - Recognize
  - Educate coaches and teammates
  - ABC's
  - Remove patient from environment
  - Remove equipment/clothing
  - Ice packs
  - Evaluate core temperature
  - Oral rehydration
  - Mental status
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57 **Heat Illness**

- Emergency Department Evaluation
  - Temperature >104deg
  - Mental status changes
  - Persistent vomiting
  - Call 911
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58 **Heat Illness**

- Heat stroke complications
  - Seizures
  - Hypotension
  - Rhabdomyolysis
  - Liver injury
  - Arrhythmias
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59 **Heat Illness**

- Prevention !!!
- Knowledge
- Relative rehydration
- Evaluate athletes with inter-current illness
- Body weights
- Acclimatization*
- Clothing
- Frequent breaks

60 **Heat Illness**

- American College of Sports Medicine
  - 6 day acclimatization
  - 1 practice/day of < 3 hours
  - Day 1,2 - helmet only
  - Day 3-5 - helmet and shoulder pads
  - Day 6 - full equipment
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61 **Heat Illness**

- Prevent dehydration
  - Increase risk
  - Hydrating before practices
  - 16 oz for every pound lost
  - Monitor urine color and output
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62 **Heat Illness**

- Return to play
  - Mild

- 24 hours

- Heat stroke
  - Until cleared by physician
  - 1 week with graduated return to training

63 **Heat Illness**

- Heat related illness are PREVENTABLE!
- Heat related illness → spectrum of disease
- Recognize early and treat aggressively
- Educate, Educate, Educate

64 **Heat Illness**

- Case
  - 12yo obese male begins to complain about "feeling tired and nauseated" during football practice. The team is beginning the 2nd hour of practice in 95 degree heat in south Texas. This is the teams 3rd practice of the season and boy has never played sports previously. He is told by the assistant coach to drink some more water because he is sweating so much but it is told to continue practice. Approximately 30 minutes later the boy collapses and begins to have seizure like activity. EMS is called to the scene.

65 **Heat Illness**

- What the factors that put him at risk?
- What are the important signs of worsening illness?
- What do you do next?

66 **REFERENCES UPON REQUEST**

QUESTIONS