Preventing Sudden Death in Sports (Part I)
2012 Collegiate Athlete Deaths

3 Total Deaths (1 Football, 1 Cross Country, 1 Swimming)
2 Drowning and 1 Unknown
William Wayne Jones III

- Tennessee State University
- November 7, 2012
- Sport: Football
- Activity: Practice
- Age: 19
- Cause of Death: Unknown
Tajay Hoppines

- Valdosta State University
- August 8, 2012
- Sport: Cross Country
- Activity: Team Building Activity
- Age: 18
- Cause of Death: Drowning
- Information: Pre-season post practice swim
Ivan Maciuniak

- Oklahoma Baptist University
- March 8, 2012
- Sport: Swimming
- Activity: Swimming
- Age: 22
- Cause of Death: Drowning
Facts and Figures (Journal of American Heart Association)

- 2004 – 2008
  - 273 Athlete Deaths out of 1,969,663 participant years
  - 68% occurred due to accidents, suicide, homicide and drug overdoses
  - Male vs. Female
    - Male: 1 out of every 33,134
    - Female: 1 out of every 76,646
  - Black vs. White
    - Black: 1 of 17,696
    - White: 1 of 58,653
  - Sports
    - Basketball (1 of 11,394) followed by swimming, lacrosse, football and cross country
    - Div. I Basketball (1 of 3,000)
NATA Position Statement:

Preventing Sudden Death in Sports

Douglas J. Casa, PhD, ATC, FNATA, FACSM* (co-chair);
Kevin M. Guskiewicz, PhD, ATC, FNATA, FACSM† (co-chair);
Scott A. Anderson, ATC‡;
Ronald W. Courson, ATC, PT, NREMT-I, CSCS.§;
Jonathan F. Heck, MS, ATC ||;  
Carolyn C. Jimenez, PhD, ATC¶;
Brendon P. McDermott, PhD, ATC#;
Michael G. Miller, PhD, EdD, ATC, CSCS**;
Rebecca L. Stearns, MA, ATC*;
Erik E. Swartz, PhD, ATC, FNATA††;
Katie M. Walsh, EdD, ATC‡‡
Conditions

- Asthma
- Catastrophic Brain Injuries
- Cervical Spine Injuries
- Diabetes
- Exertional Heat Stroke
- Exertional Hyponatremia
- Exertional Sickling
- Head-down Contact in Football
- Lightning
- Sudden Cardiac Arrest

On note: 2 of 3 Deaths in College Athletics in 2012: Drowning
Things to Keep in Mind

- Recommendations vs. Standards
- Implications for a Standard of Care
  - Guidelines and Recommendations vs. Standard of Care
- Legal
- Practicality
- Do I currently do?
  - Exercise
- What’s missing from the recommendation?
- What would it take to meet all of the recommendations?
Asthma (12)

2009, 22 million people in the US with approximately 6 million children
Asthma Recommendations

- Preventions and Screening (3)
  - Thorough Medical History and Physical Exam (B)
  - Structured warm-up (B)
  - SA Education on: asthma meds as prophylaxis, spirometry devices, asthma triggers, S&S and compliance. (C)

- Recognition (3)
  - S&S: confusion, sweating, drowsiness, forced expiratory volume in first second of less than 40%, wheezing, cyanosis, coughing, hypotension, brachycardia or tachycardia, mental status changes, LOC, inability to lie supine (A)
Asthma Recommendations

- Recognition Continued
  - Spirometery tests should be performed at rest and with exercise and a sport specific environment on suspected athletes (B)
  - Increase in 12% of FEV1 after administration of an inhaled bronchodilator also indicates reversible airway disease
Asthma Recommendations

- Treatment (6)
  - Short-acting $\beta_2$-agonist with acute exacerbation. **If 3 administrations do not relieve distress, transport to medical facility (A)**
  - Inhaled corticosteroids or leukotriene inhibitors can be used for asthma prophylaxis and control. Long-acting $\beta_2$-agonist combined with other meds to control asthma (B)
  - **Supplemental oxygen should be offered during asthma attack (B)**
  - Lung function should be monitored with peak flow meter and compared to baseline measures (B)
  - **Remove from trigger factors (smoke, allergens, air quality) (C)**
  - Physical activity should be initiated at low aerobic levels and gradually increased with monitoring of symptoms (C)

Prevention?
Asthma: Things to Consider

- Are any additional test / questions provided to student athletes that present with hx of asthma or asthma related symptoms of unknown origin?
- Would it be helpful to obtain background information (testing, Rx history, diagnosis, etc) from previous physician(s) similar to what is done in ADD / ADHD issues?
- Is supplemental oxygen present at your institution for those with asthma?
- Do you obtain emergency inhalers on behalf of student athletes? De-identified emergency inhaler?
Catastrophic Brain Injuries (8)
Prevention (2)

- AT responsible for coordinating educational sessions for athletes and coaches (C)
- AT should enforce the use of certified helmets but do not prevent concussion but would help prevent catastrophic head injury (B)
Recognition (1)

- AT should incorporate use of a comprehensive objective concussion assessment battery that includes:
  - Symptom
  - Cognitive
  - Balance

Note: “Should not be used in isolation” (A)
Treatment (5)

- Acute Care Medical Management Plan for an athlete with potential intracranial hemorrhage or diffuse cerebral edema should be implemented (B)
- Symptoms persist, worsen or LOC deteriorates following concussion, refer to MD trained in concussion management (B)
- Oral and written instructions for home care should be given to athlete and responsible adult (C)
Treatment Continued

- RTP following a graduated progression once the athlete is completely asymptomatic (C)
- SA monitored periodically throughout and after sessions to determine if symptoms develop or increase in intensity (C)
Cervical Spine Injuries (16)
Prevention (4)

- ATCs understand sport-specific causes of CSI and physiological responses (C)
- Coaches and SAs educated on mechanism of CSI (C)
- Corrosion-resistant hardware used on helmets and checked regularly and helmets undergo regular reconditioning and recertification (B)
- Emergency personnel familiar with athletic equipment removal (C)
Recognition (1)

- Presence of the following requires the initiation of the spine injury management protocol (SIMP) (A)
  - LOC or Altered Level of Consciousness
  - Bilateral Neurological Findings or Complaints
  - Significant Midline Spine Pain with or without palpation
  - Obvious Spinal Column Deformity
Treatment and Management (SIMP) (7)

- Spine in Neutral Position with Stabilization (B)
- Traction must not be applied to cervical spine (B)
- Immediate attempts to expose the airway (C)
- If rescue breathing is needed, the person with the most training and experience should begin rescue breathing using the safest technique (B)
- Rescuers should realign spine
  - Contraindications for realignment: pain caused / increased by movement, neurologic symptoms, muscle spasm, airway compromise, physical difficulty repositioning, encountered resistance, or apprehension expressed by patient (B)
- Manual stabilization converted to immobilization with external devices
  - Manual stabilization resumed following application of external devices (B)
- Immobilization with a long spine board or other full-body immobilization device (B)
Equipment-Laden Athletes (4)

- Primary Goals: ensure the cervical spine is stabilized in neutral and vital life functions are accessible (C)
  - Removal of shoulder pads and helmet should be deferred until transported to emergency facility except in three (3) circumstances
    - Helmet is not properly fitted to prevent movement of the head independent of the helmet
    - Equipment prevents neural alignment of cervical spine
    - Equipment prevents airway or chest access

- Full face-mask removal using established tools / techniques is executed once transportation is determined (C)
- If possible, a team physician or AT should accompany athlete to hospital (C)
- Remaining protective equipment should be removed by appropriately trained professionals in emergency department (C)
Things / Thoughts to Consider

- Equipment
  - Spine Board?
  - Facemask Removal Tools
  - Emergency Equipment (AED, Breathing Mask, Etc.)
  - Stabilization Materials (Blocks, Towels, Etc.)
- Most rehearsed emergency situation?
Diabetes Mellitus (10)
Diabetes Information

- Normal Blood Glucose Levels: 70-110 mg/dL
- Metabolic Disease
- 2010: 26 million people with 7 million undiagnosed
  - 79 million with prediabetes
  - 1 in 400 under the age of 20
- Estimated $132 billion in US healthcare cost
- 5-10% are Type 1
Prevention (3)

- SAs with diabetes should have a diabetes care plan (C)
  - Blood Glucose Monitoring and Insulin Guidelines, Treatment Guidelines for Hypoglycemia and Hyperglycemia and Emergency Contact Info
- Hypoglycemia Prevention: Blood Glucose Monitoring, Carbohydrate Supplementation and Insulin Adjustments (B)
- Hyperglycemia Prevention: Blood Glucose Monitoring, Insulin Adjustment and Urine Testing for Ketone Bodies (C)
Diabetes Care Plan

- Identify blood glucose targets for practices and games
  - Including exclusions thresholds
- Strategies to prevent exercise-associated hypoglycemia, hyperglycemia and ketosis
- List of medications used for glycemic control
- S&S and Tx protocols for H,H and K
- Emergency Contact Information
Blood Glucose Monitoring

- Recommendation:
  - 2-3 times before activity
  - Every 30 minutes during
  - Every other hour up to 4 hours post activity
Recognition (3)

- Hypoglycemia S&S: Tachycardia, Sweating, Palpitations, Hunger, Nervousness, Headache, Trembling, or Dizziness and in severe cases, LOC and death may occur (C)
- Hyperglycemia without Ketosis S&S: Nausea, Dehydration, Reduced Cognitive Performance, Feelings of Sluggishness and Fatigue (C)
- Hyperglycemia with Ketoacidosis S&S: Those listed above plus Kussmaul breathing (abnormally deep, very rapid sighing respirations characteristic of diabetic ketoacidosis), fruity odor of breath, unusual fatigue, sleepiness, loss of appetite, increased thirst, and frequent urination (C)
Treatment and Management (4)

- Mild Hypoglycemia: Administering 10-15 g of carbohydrates (4-8 glucose tables or 2 tablespoons of honey) and reassessing blood glucose levels immediately and 15 minutes later (C)

- Severe Hypoglycemia: Medical Emergency, Administering Glucagon for trained healthcare professionals (C)

- ATs should follow ADA guidelines for athletes exercising during hyperglycemic periods (C)

- Physicians should determine a safe blood glucose range for RTP after an episode of mild hypoglycemia or hyperglycemia (C)
Things to Consider

- How many students athletes are known to have diabetes?
- Well controlled?
- For SAs with PMH for Diabetes, do you obtain past physician and testing information?
- AM Conditioning / Practice Sessions?
- Post Career Diabetes Education = Prevention
Prevention (5)

- Within PPE, SAs questioned about risk factors for heat illness including history of heat illness (C)
- Special considerations and modifications for those wearing protective equipment during high environmental stress (B)
- Acclimatized to the heat gradually over a period of 7 to 14 days (B)
- SAs maintain consistent level of euhydration and replace fluids lost during activity. SAs should have free access to readily available fluids at all times, not only during breaks. (B)
- ATs should educate “relevant personnel” (coaches, administrators, security guards, EMS staff, SAs) about preventing heat illness and the P&P in the event of an incident (C)
Recognition (2)

- Criteria for EHS Diagnosis:
  - Core Body Temperature (CBT) of greater than 104-105 degrees taken via rectal thermometer soon after collapse
  - CNS Dysfunction: disorientation, confusion, dizziness, vomiting, diarrhea, loss of balance, staggering, irritability, irrational or unusual behavior, apathy, aggressiveness, hysteria, delirium, collapse, LOC, coma (B)
Treatment (2)

- Reducing CBT to less than 102 degrees in less than 30 minutes
  - Cold-water immersion is the fastest cooling modality
    - Water Temp: 35-59 deg and continuously stirred
  - Cooled first and transported second (B)
- RTP:
  - Period of no activity, an asymptomatic state, and normal blood enzyme levels before the athlete begins a gradual return under medical supervision
  - Low intensity in a cool environment and advance to high intensity exercise in a warm environment (C)
Things to Consider

- Equipment
  - Cold Tub
  - Rectal Thermometer
  - Readily available water
- Noticeably Absent
  - Recommendations on participation in heat (ambient temp.) or heat index
- Equipment: Environmental Thermometer
Preventing Sudden Death in Sports (Part II)
Conditions

- Exertional Hyponatermia (12)
- Exertional Sickling (11)
- Head-Down Contact in Football (10)
- Lightning (10)
- Sudden Cardiac Arrest (5)
Exertional Hyponatermia (12)
Background

• More frequent in females than males
• Events lasting longer than 4 hours (Endurance events: triathlon, marathon, etc.,)
• Causes:
  • Large intake of water
  • Large loss of salt
Prevention (5)

- Establish an individualized hydration protocol based on:
  - Sweat Rate
  - Sport Dynamics
  - Environmental Factors
  - Acclimatization State
  - Exercise Duration & Intensity
  - Individual Preferences (B)

- Adequate dietary sodium at meals when active in hot environment (B)
- Postexercise rehydration aimed at correcting fluid loss (B)
- Body weight changes, urine color and thirst offer clues for rehydration (A)
- Athlete educated about proper fluid and sodium replacement (C)
Recognition (3)

- ATCs should recognize EH S&S during or after exercise:
  - Overdrinking, Nausea, Vomiting, Dizziness, Muscular Twitching, Peripheral Tingling or Swelling, Headache, Disorientation, Altered Mental Status, Physical Exhaustion, Pulmonary Edema, Seizures, Cerebral Edema (B)

- Severe Cases, EH encephalopathy can present with:
  - Altered CNS Function
  - Seizures
  - Decreased LOC (B)

- ATC should include EH in differential diagnosis until confirmed otherwise (C)
Treatment and Management (4)

- With mental status deterioration or severe symptoms, IV hypertonic saline (3% - 5%) (B)
- Mild: normal total body water volume, mildly altered blood sodium level (130 – 135 mEq/L with normal being 135 – 145 mEq/L), restrict fluids and consume salty foods or small volume of oral hypertonic solution (C)
- With severe EH, transportation to advanced medical facility (B)
- RTP should be guided by a plan to avoid future EH episodes, specifically focused on individualized hydration plan (C)
Exertional Sickling (11)
Background

- No contraindications to play
- Frequency
  - African Americans: 8%
  - Hispanic: 0.5%
  - Whites: 0.2%
- Usually occurs in first half hour
- Core temperature usually <104 deg
Prevention (3)

- Education of coaches, athletes and parents* about complications of SCT (C)
- Targeted education and tailored precautions may provide a margin of safety for SCT athlete (C)
- SCT Athletes:
  - Longer rest periods and recovery
  - Excluded from performance tests: mile runs and serial sprints
  - Adjust work-rest cycles with environmental heat stress
  - Emphasize hydration
  - Control asthma
  - Not working out if not feeling well
  - Supplemental oxygen (B)
Recognition (3)

- Screening for SCT, by self-report is a standard component of the PPE monograph. Testing for SCT confirms status (A)
- AT know S&S of SCT:
  - Muscle cramping, pain, swelling, weakness, tenderness, inability to catch one’s breath, and fatigue (C)
- AT should understand usual settings for and patterns of exertional sickling (C)
Treatment (5)

- SCT athletes with S&S of exertional sickling warrant immediate withdrawal from activity (C)
- High-flow oxygen at 15L/min with a nonrebreather face mask should be administered (C)
- AT, monitor vitals and initiate EAP with vitals decline (C)
- Sickling collapse should be treated as a medical emergency (C)
- AT has responsibility to notify treating physicians are aware of presence of SCT and thus prepared to treat metabolic complication so explosive rhabdomyolysis (B)
Things to Consider

- NCAA Implications on SCT Screening / Confirmed Status
- Student Athlete Acknowledgement of SCT Including:
  - Risk Factors
  - Signs and Symptoms
  - Genetic Considerations
- Who knows SCT Status:
  - ATCs
  - Coaches
  - S&C

Ryan Clark – Pittsburgh Steelers
Head Down Contact in Football (10)
Prevention (8)

- Axial loading is the primary mechanism for catastrophic cervical spine injury (A)
- Intentional and unintentional head-down contact are dangerous and may result in axial loading leading to catastrophic injury (A)
- Football helmets and other standard football equipment do not cause or prevent axial-loading injuries (A)
- Injuries that occur as a result of head-down contact are technique related and are preventable to the extent that head down contact is preventable (C)

Note: Are these recommendations or statements?
Prevention (Continued)

- Head up contact allows for the neck musculature, intervertebral discs and the cervical facet joints to prepare for contact (C)
- Athletes who continue to drop their heads just before contact need additional coaching and practice time (C)
- Initiating contact with the face mask is a rule violation and must not be taught (C)
Prevention (Continued)

- Formal team education sessions (conducted by AT, team physician and with the support of coaches) should be conducted twice per season (C)
  - One session conducted before contact begins and the other at the midpoint of the season
- Topics:
  - Mechanisms of head and neck injuries
  - Related rules and penalties
  - Incidence of catastrophic injury
  - Severity and prognosis for these injuries
  - Safest contact position
- Recommended Videos
  - Heads Up: Reducing the Risk of Head and Neck Injuries in Football
  - Tackle Progression
Recognition (2)

- Coaching, officiating and playing techniques must focus on decreasing all head-down contact, regardless of intent (C)
- Officials should enforce head down and head first contact penalties thus bringing more awareness to coaches and players about the effects of head-down contact (B)
Things to Consider

- Should “Head-down contact in football” be a condition or is it accounted for in “Cervical Spine Injuries”? 
Lightning Safety (10)
Lightning Facts

- Responsible for 60 deaths in US annually
- 5x hotter than surface of sun
- Weather Watcher: Identified in policy and whose job is to look for deteriorating weather. Has the unchallengeable authority to clear a venue when conditions warrant.
- Use of federal weather monitoring Web sites is encouraged.
Prevention (6)

- When thunder is heard or lightning seen, people should vacate to a previously identified safe location (A)
- Establish an EAP or policy specific to lightning safety (C)
- Safe places: structures with 4 substantial walls, solid roof, plumbing and electric wiring (B)
Prevention Continued

- Buses / cars with windows up and metal roofs can be used as safe places (B)
- People should remain entirely inside a safe building or vehicle until at least 30 minutes since last lightning strike or sound of thunder (A)
- People injured by lightning strikes while indoors were touching electric devices, using landline phone or plumbing or in rooms with open windows (B)
Treatment and Management (4)

- Victims are safe to touch and treat, but first responders must ensure their own safety from imminent lightning strikes (A)
- Triage first lightning victims that appear to be death (most due to cardiac arrest) thus starting CPR and defibrillation (A)
- Apply an AED and perform CPR as warranted (A)
- Treat for concussive injuries, fractures, dislocations and shock (A)
Things to Consider

- Detection Equipment / Services
  - Athletics vs. Campus
- Who is in charge?
- Camps
- Spectator Considerations
- #1 Discussed Item at Conference Sports Medicine Meetings
Sudden Cardiac Arrest (5)
Background

- SCD Incidence Rate:
  - HS: 1:100,000 to 1:200,000
  - College: 1:65,000 to 1:69,000
    - NCAA: 1:43,000
- Prevention:
  - 80% of SCD are asymptomatic until SCA occurs
- Screening Debate
- Improved History and Physical Exam: 2007 AHA Guidelines
Emergency Preparedness

- EAP:
  - Specific to each athletic venue
  - Effective communication system
  - Training of likely first responder in CPR and AED use
  - Acquisition of necessary emergency equipment
  - Coordinated and practiced response plan
  - Early access to defibrillation
  - Identify person or group responsible for:
    - Documentation of personnel training
    - Equipment maintenance
    - Actions taken during the emergency
    - Evaluation of the emergency response

Survival rates of 41% - 74% when bystander CPR provided and defibrillation occurs within 3 to 5 minutes of collapse
Prevention (2)

- Access to early defibrillation is essential. Less than 3-5 minutes from time of collapse to delivery of first shock is strongly recommended (B)
- PPE should include the following:
  - Episodes of exertional syncope
  - Presyncope
  - Chest Pain
  - Personal or family history of sudden cardiac arrest / sudden death
  - Exercise intolerance (C)
Recognition (2)

- SCA should be suspected in any athlete who has collapsed and unresponsive. A, B, Cs and heart rhythm (using AED) should be assessed (B).

- Myoclonic jerking or seizure-like activity is often present after collapse from SCA and should not be mistaken for seizure (B).
Management (1)

- CPR should be provided with AED is being retrieved. Treatment should be conducted in accordance to AHA guidelines (B)
Things to Consider

- EAP Information not mentioned as a recommendation?
- Ongoing debate over invasive screening: EKG, echocardiogram, etc.,
- Emphasis on coaches / S&C personnel in EAP, CPR and AED training
Concluding Thoughts
Equipment Needs for 10 Conditions

- Emergency Inhalers
- Emergency Oxygen
- Peak Flow Meters
- Face Mask Removal Equipment
- Cervical Collars
- Spine Board?
- Blood Glucose Monitoring
- Glucose Tablets
- AED
- Cold Plunge Pools / Tubs
- Rectal Thermometer
- IV Administration Equipment
- Lightning Detector?
- Airway Equipment
Total Recommendations

- Asthma: 12 (11)
- Catastrophic Brain Injuries: 8 (8)
- Cervical Spine Injuries: 16 (16)
- Diabetes: 10 (5)
- Exertional Heat Stroke: 9 (8)
- Exertional Hypernatremia: 12 (9)
- Exertional Sickling: 11 (9)
- Head Down Contact in Football: 10 (4)
- Lightning: 10 (6)
- Sudden Cardiac Arrest: 5 (4)
- Total: 103 (80) – 23 Informational Statements & 80 Recommendations
Other Causes of Athletic Death

- Drowning
- Anaphylaxis
  - Bee Stings
  - Food Allergies