

# ***Non Cardiac Death in Sport***

Professor Sanjay Sharma

Cardiology Clinical and Academic Group

St George's, University of London

Medical Director for Virgin Money London

Marathon and Prudential Ride London

[sasharma@sgul.ac.uk](mailto:sasharma@sgul.ac.uk)



@SSharmacardio



**St George's**  
University of London

# Non Cardiac Deaths in Sport

Trauma (cycling, car racing, football)

Heat stroke

Exercise associated hyponatraemia

Drugs

Asthma

Subarachnoid haemorrhage

# Epidemiology of Sudden Death in Young, Competitive Athletes Due to Blunt Trauma

Mathew Thomas, Tammy S. Haas, Joseph J. Doerer, James S. Hodges, Brittany O. Aicher, Ross F. Garberich, Frederick O. Mueller, Robert C. Cantu and Barry J. Maron

30 year National Registry (1980-2009).

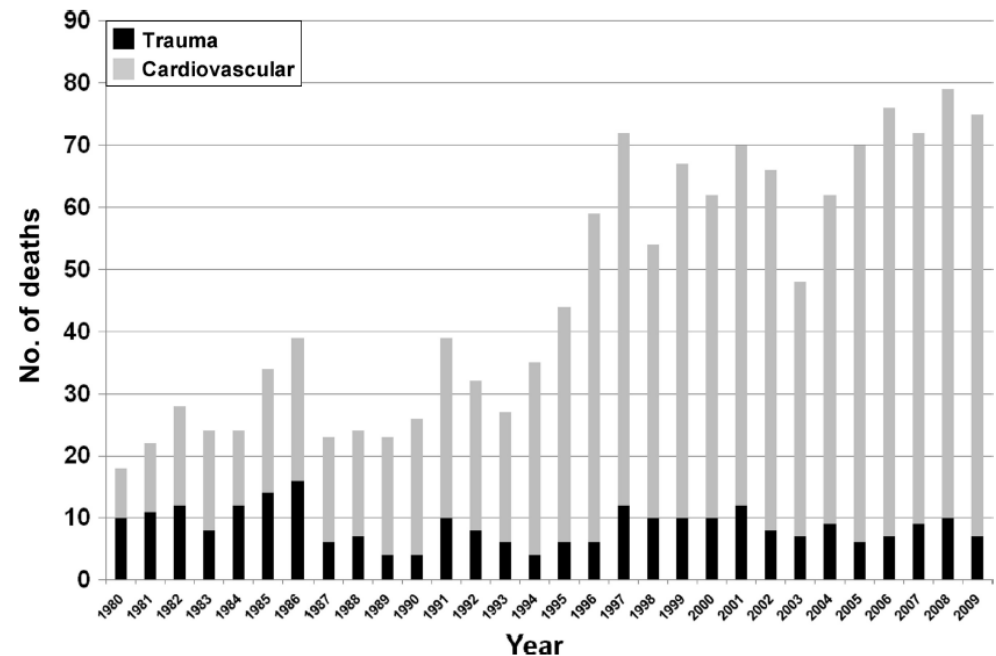
1827 athletes aged  $\leq 21$  years old.

261 (14%) due to trauma. Mean age  $16 \pm 2$  years.

Usually impact head and neck injuries

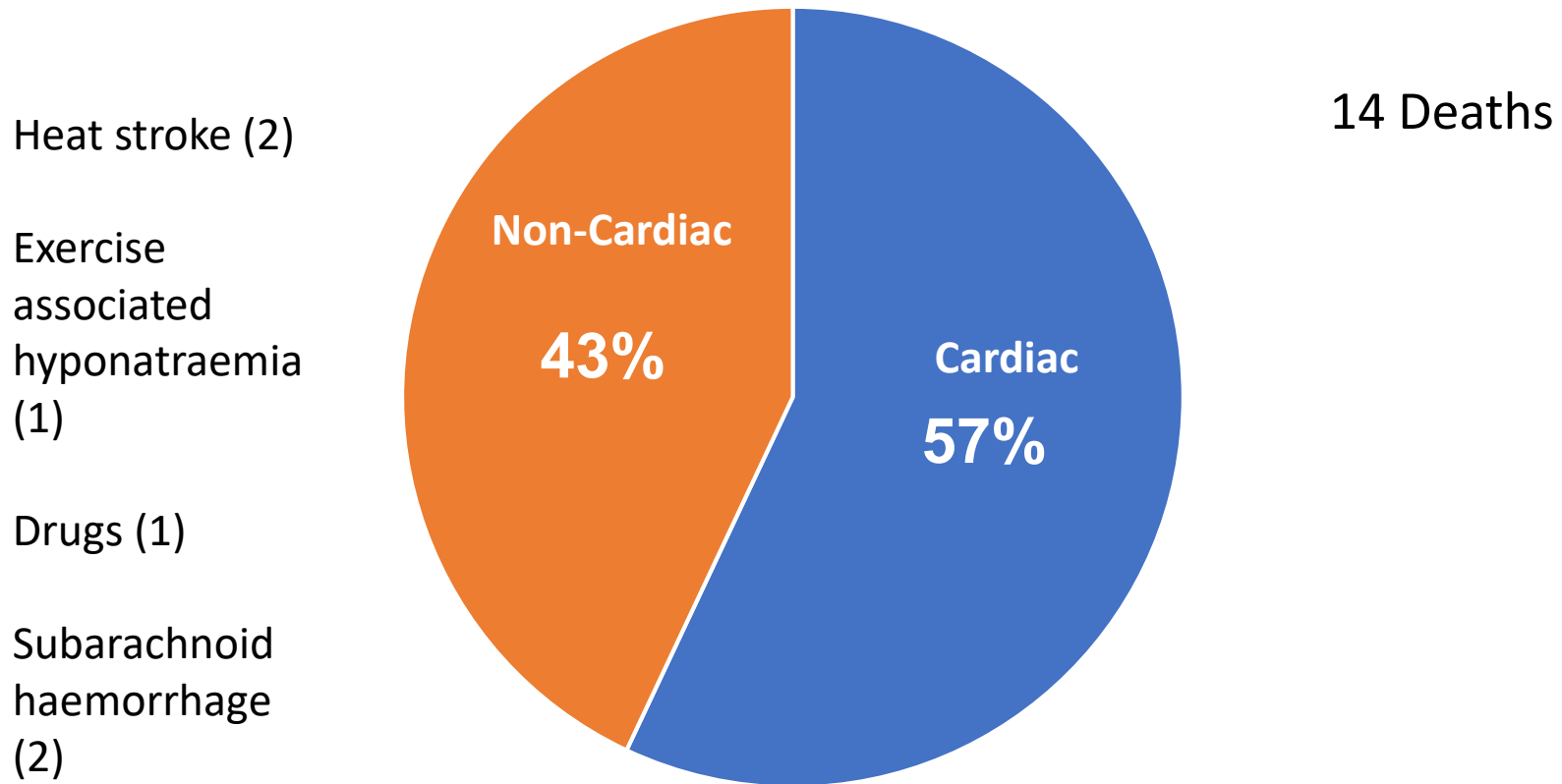
Football was the most prevalent sport (47%)

Paediatrics. 2011;128:e1



4 fold less than cardiovascular deaths in sport

# Deaths at the London Marathon 1981-2017



# Case 1

42 year old man

Collapsed after finishing first ever marathon

Finishing time 3 hours 28 min

Blood results:

Asystole

Sodium 153 mmol/L

Active resuscitation commenced

Potassium 4.2 mmol/L

IV saline (0.9%) infusion

Creatinine 174 umol/L

Glucose 4.2 mmol/L

On arrival to hospital, core temperature 42°C

Autopsy: structurally normal heart. Hypercontractile myocytes

# Lessons Learnt:

In endurance events initial assessment of collapse

Airways

Breathing

Circulation

Core temperature

Cool whilst resuscitating

# Heat Stroke

Temperature  $> 40^{\circ}\text{C}$  accompanied by  
multi-organ dysfunction

# Determinants of Body Temperature

## Environmental

Ambient temperature

Relative Humidity

## Individual factors

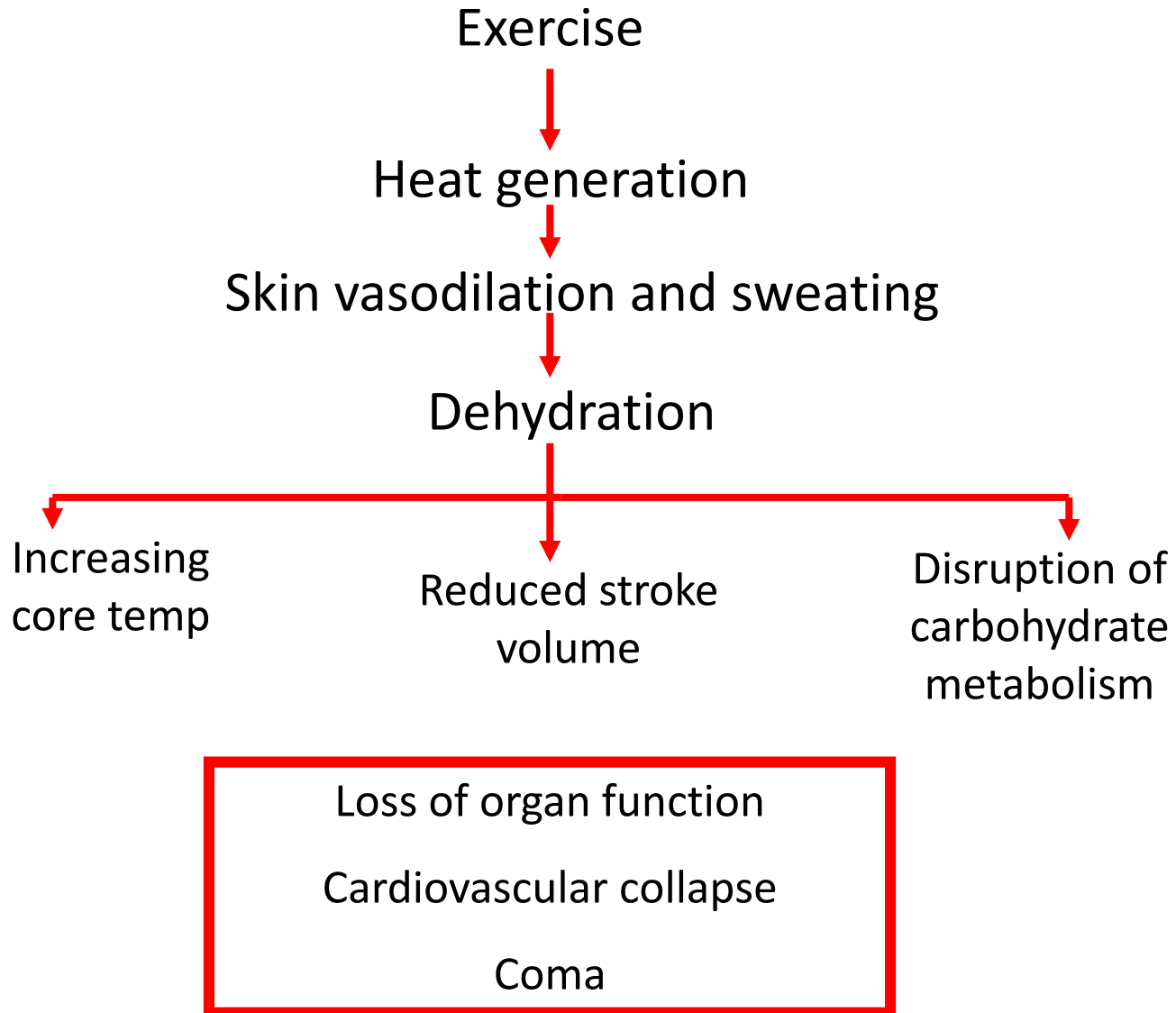
Hydration status

Aerobic conditioning

Heat acclimatisation status



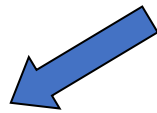
# Pathophysiology of Heat Stroke



# Heat Stroke: Clinical Manifestations

Can be fatal.

## Pathophysiology



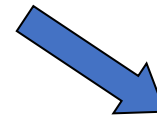
### Reduced organ perfusion

Hepatic necrosis

Renal failure

Lactic acidosis

DIC



### Disruption of carbohydrate metabolism

Myocardial depression

Cerebellar syndrome

Hypothalamic  
dysfunction

# Clinical Manifestations of Heatstroke

## General

Fatigue

Impaired judgement

Flushing

Collapse

Chills

Hyperventilation

Dizziness

## Neurological

Unsteady gait

Delirium

Bizarre behaviour

Amnesia

Stupor

Seizure

Coma

# Heatstroke: London Marathon Experience

1 in 3,500 runs

20% of all hospital admissions

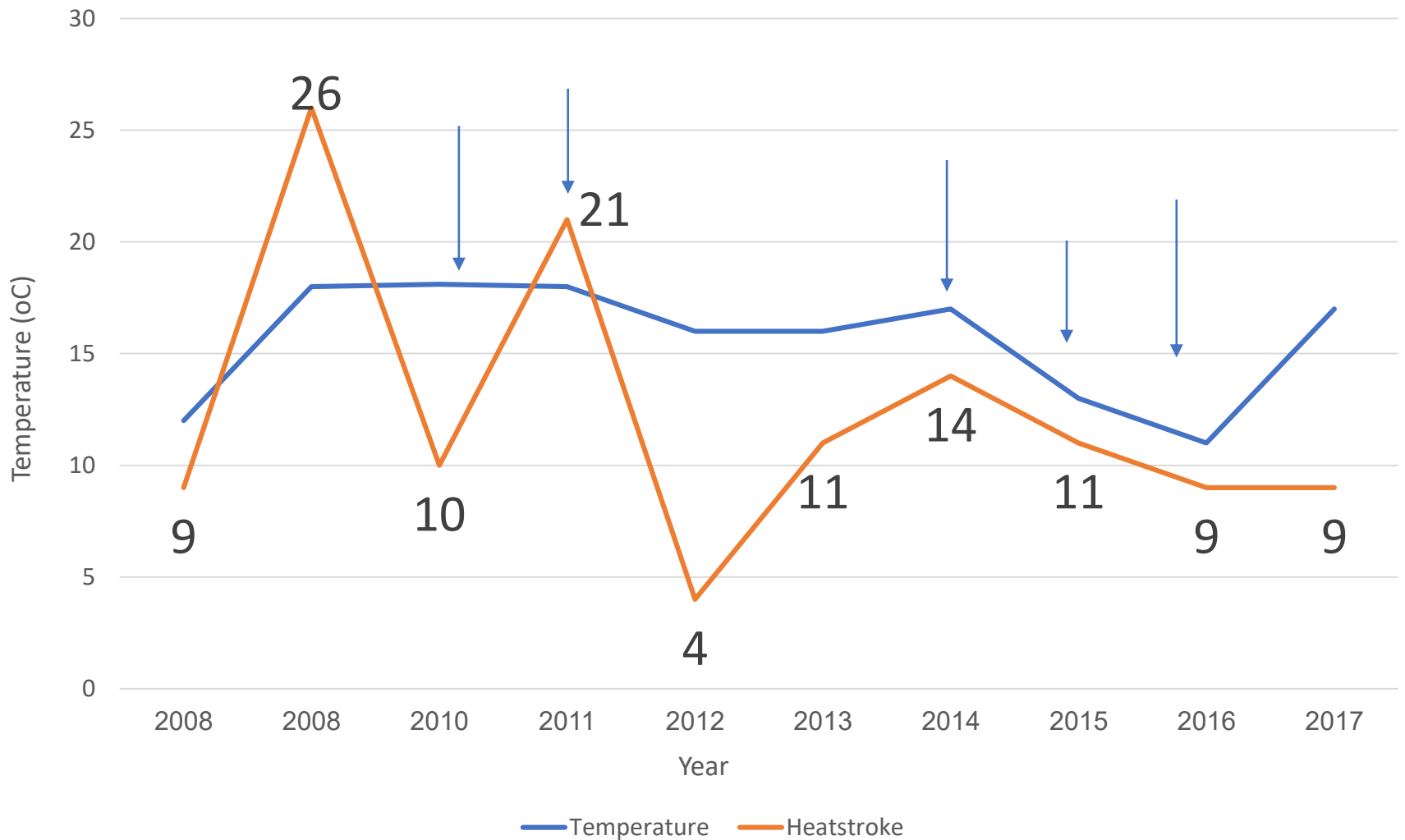
Predominantly in males under 40 years old with large BSA

2 deaths and 4 near fatal cases (5.2%)

Fatality/near fatality rate 1 in 67,000

Sudden cardiac arrest: 1 in 55,500

# Cases of Heatstroke in Relation to Ambient Temperature



# Life-Threatening Events During Endurance Sports

## Is Heat Stroke More Prevalent Than Arrhythmic Death?

Yankelson et al. JACC. 2014; 5: 463-9

137,580 runners

Over 7 years 21 athletes admitted

2 died therefore deaths

Mortality 1/69,000

19 admissions from heat stroke (12 life threatening and 2 fatal)

# Management of Heatstroke

“Golden hour”!

Immersion into cool water tub (0-18°C)

**C**ollapse

Ice packs in axillae, groin and neck

**C**onfused

Measure rectal temp every 5-10 mins.

End-point temperature for cooling is 39°C

**C**ore temperature

Monitor blood glucose

**C**ool aggressively if > 40°C

Rehydration (usually require IV fluids)

Diazepam IV for severe cramps/seizures

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# Case 2

22 year old male. Fitness instructor. First marathon run

Collapsed shortly after the race. Finishing time 3 hours 56 mins

Calf sprain a week earlier and was taking non steroidal anti-inflammatory drugs

Unresponsive. Glasgow coma scale score 3

Pulse 110 bpm. Systolic blood pressure 110 mm Hg.

Respiratory rate 26 breaths per minute. Core temp 36.1°C

Fixed dilated right pupil. Frothing at the mouth.

# Case 2 continued:

Differential diagnosis:

Subarachnoid haemorrhage

Cerebral oedema due to dilutional hyponatraemia

Serum sodium 122 mol/L

Features of florid pulmonary oedema

Endotracheal intubation. Ventilated with 100% oxygen

Bolus of 1.8% saline.

Cardiac arrest (pulseless electrical activity)

# Exercise Associated Hyponatraemia

Serum sodium < 135 mmol/l (asymptomatic or symptomatic)

Dilutional (excess intake of hypotonic fluids)

Syndrome of inappropriate ADH may also contribute.

Can result in cerebral oedema, pulmonary oedema and death

Prompt diagnosis and urgent treatment is crucial

Initially confined to endurance sports

Now reported in rowing, rugby and yoga



# The Incidence of Exercise-Associated Hyponatraemia in the London Marathon.

Courtney Kipps, Sanjay Sharma and Dan Tunstall Pedoe

*Br. J. Sports Med.* published online 20 Jul 2009;  
doi:10.1136/bjism.2009.059535

Prevalence of asymptomatic hyponatraemia is 12.5%

Prevalence of symptomatic hyponatraemia is proportional to the ambient temperature.

More common in women with low BMI

Slow pace runners (4 and a half hours)

Fluid consumption > 3.5 litres



# Management of EAH

Sodium < 135 mmol/l

Neurological symptoms/signs

100 ml 3% Saline bolus

Up to 2 additional boluses may be administered if no improvement at 10 min intervals if no improvement

Transfer to hospital if remains symptomatic

# Case 3

A 32 year old female collapsed 1 mile from the finish.

Had run 2 marathons in the past 2 years.

Immediate medical assistance.

Pulseless. Asystole on monitor

Resuscitated for 2 hours without any rhythm

# Case 3

Boyfriend mentioned that she had taken a supplement.

JAK3D contains dimethylamylamine (DMAA) which is an amphetamine derivative

Post mortem showed normal heart.

Toxicology screen positive for DMAA.

## **Asthma deaths during sports: Report of a 7-year experience**

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Jack M. Becker MD,<sup>a</sup> James Rogers, BS, AT,C,<sup>b</sup> Gregory Rossini, MD,<sup>c</sup>  
Haresh Mirchandani, MD,<sup>d</sup> and Gilbert E. D'Alonzo, Jr, DO<sup>b</sup> *Philadelphia  
and Lancaster, Pa*

Temple sports asthma research centre.

Deaths collated through a reporting service (newspapers) over 7 years (1993-2000)

Only included deaths where asthma occurred during sport and was considered a cause of death at autopsy

61 deaths

91% had mild asthma

Mostly male (70%)

Age 10-20 years (74%)

White: black athletes = 2:1

More common in competitive v recreational athlete (57% v 43%)

51% competitive athletes had fatal event during competition.