The chain of survival in pre-hospital cardiac arrest - a HEMS perspective

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HEMS doctor
Essex and Hertfordshire Air Ambulance
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- Established in 1997
- Charity funded
- £380,000 pounds a month
- Essex
  - Earls Colne Airfield
- Hertfordshire
  - North Weald Bassett
Aims of presentation

- The system of triage for pre-hospital cardiac arrest
- What can HEMS offer
- Team approach to the chain of survival in pre-hospital cardiac arrest
- A case study from our region
Pathway

999 call

Call handler

HEMS critical care desk screen calls

HEMS dispatched
HEMS taskings to cardiac arrests

- Decision of critical care desk (CCD)
  - HEMS paramedic and dispatcher

- Factors determining dispatch
  - Age
  - Witnessed
  - Bystander CPR
  - Location
East of England Ambulance Service

- North East
  - Suffolk and Norfolk

- North West
  - Cambridge and Bedfordshire

- South East
  - Essex

- South West
  - Hertfordshire
Cardiac Arrest by sector (2012)
Average Time to Scene (2012)

- NSC: 08:33
- Essex: 08:05
- B&H: 07:27
HEMS cardiac arrests 2012

- Taskings: 225
- Attended: 131
- ROSCs: 47
- ROSC rate: 36%
What HEMS can offer

- Assessment and diagnosis
- Autopulse or ACD
- ResQPOD
- Rapid sequence induction
What HEMS can offer

- Active monitored cooling
- Thrombolysis
- Expedited transfer to PCI
- Triage options in non-cardiac causes
• Autopulse
• ACD
  – Active compression decompression device
• ResQPOD
What we aim to achieve

- Optimum patient outcome
- Close teamwork with land crews
- Education and understanding of our treatment and triage decisions
- Closer links with local PCI centres
Cardiac ‘KPIs’

‘Key performance indicators’

- Maintaining standards
- Auditing practice

**During cardiac arrest:**
- ETCO2 monitored and recorded
- Artery managed with SGD or ETT
- Oxygenation optimised throughout
- Chest compressions with ACD or Autopulse
- Thrombolysis considered
- Impedance Threshold Device applied (ReS(Q)CD)
- Intravenous or intraosseous access obtained
- Defibrillation and drug therapy according to ERC guidelines 2010
- Minimise hands off time
- 30mls/kg cold intravenous fluid started during arrest
- Working diagnosis described in the patient record

**After Return of Spontaneous Circulation:**
- ECG obtained and interpreted
- Core temperature recorded
- Definitive airway secured
- Long-acting neuromuscular blockade initiated
- No signs of anaesthetic awareness
- BM measured and noted
- SpO2 maintained at 94-98%
- Decision to transfer to PCI centre documented
Cardiac KPIs

During cardiac arrest

- ETCO2 monitored
- Airway SGD or ETT
- Oxygenisation optimised
- ACD or autopulse
- ?Thrombolysis
- ResQPOD
- iv access
- ERC guidelines 2010
- Minimise hands off time
- 30mls/kg cold iv fluids started during arrest
- Working diagnosis documented
After ROSC

- 12 lead ECG
- Core temperature
- Definitive airway secured
- Neuromuscular blockade

- No signs of anaesthetic awareness
- BM measured
- SpO2 94-98%
- Decision to transfer to PCI centre noted
What dictates transport options

- Not able to defibrillate on helicopter
- The ‘what ifs’
- Most PCI centres require a secondary transfer by land ambulance
Case study

- 44 year old female, cardiac arrest
- On response car due to poor weather
- Bystander CPR by husband
- RRV and ambulance crew arrive
- VF followed → shock → ROSC
HEMS arrive

History of mitral stenosis and ?valvotomy

On warfarin and sotolol

12 lead ECG - STEMI
Differential diagnoses

- Coronary artery disease

- Left atrial thromboembolic phenomenon
Triage

- Needs PCI centre
- Weather not flyable
- An hour by road
Treatment

- RSI
  - Fentanyl
  - Midazolam
  - Rocuronium

- Tenecteplase 7000u

- Aspirin 300mg
  - NG tube

- Cooling
  - Nasal temperature probe
  - Cold saline
  - Ice packs
Transfer

- ST elevation not resolving
- Pulmonary oedema
  - Sats 90%
  - ?aspiration
- Hypotensive
  - BP 80/50
  - No inotropes given
  - Cautious iv fluids
Timings

- HEMS activated: 1511
- On scene: 1545
- Depart scene: 1615
- Arrive hospital: 1708
Hospital

- ITU for assessment
- ECHO
  - Severe LV apical, lateral and inferior wall hypokinesis
  - Moderate MR
- Further episode of VT/VF
- To PCI on Lucus
PCI

- Left circumflex occluded
  - Embolectomy/thrombectomy

- IABP inserted

- No stent
ITU care

- Cooling continued
  - 33 degrees celsius

- Anti-arrhythmic therapy

- Reversal of warfarin

- Antibiotic prophylaxis
  - ?aspiration
ITU care continued

- Allowed to warm
- Neurologically normal
- Chest recovered
- Discharged home
- Elective MVR planned
Summary

• ‘The chain of survival’
  – Bystander CPR
  – Land crew/HEMS achieve ROSC
  – Advanced cardiac care continued
  – Expedited triage to PCI

• Wake, wean, discharge home

• Follow up
  – Feedback to land crews
Current developments

- Improving care
  - ‘See through CPR’

- Audit programme
  - Impact on survival

- Stronger links
  - Land crews
  - PCI centres
Thank you