Taking Mechanical CPR to New Heights: Use of Automated Chest Compression Devices in Helicopter EMS Transport

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Disclosures

- I have no disclosures
  - Images of any commercial devices are for illustration purposes only
  - Inclusion of such images in this presentation does not imply endorsement of any specific device or company

"In compliance with Federal full-disclosure laws, I'm required to tell you that I'm really not all that sure about some of this stuff."

Special thanks to...

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Co-Medical Director

...for their assistance in data analysis and presentation development!
Objective: Describe the potential role and value of Mechanical CPR (mCPR) in Helicopter EMS (HEMS) transport

- How often do patients arrest during transport?
- What do we know about manual compressions during transport?
- Could mCPR be a better method of delivering compressions during transport?
- What can we learn from a HEMS service that is utilizing mCPR?

Intra-transport cardiac arrest

Compulsory NAEMSP Annual Conference Lecture Statement:

“If you’ve seen one EMS system... you’ve seen one EMS system.”
Feb - Dec 2017

- 2362 transports
  - age ≥14 y/o (adult)
  - medical & trauma
  - scene & interfacility

- 111 cardiac arrests in-flight; approx. 5% of adult transports

STEMI → Cardiac Arrest before PCI

~6-12%

ROSC → Re-Arrest (RA)

~18-40%
Other cases possibly needing intra-transport chest compressions

What do we know about providing CPR in transport?

GOAL: High Quality CPR
Achieving High Quality CPR...

REALITY: CPR during ground transport

~20-46%

REALITY: CPR during HEMS transport

~21-59%
CPR during HEMS transport

Mechanical CPR (mCPR) vs Manual CPR (CPR)
Mechanical vs. Manual CPR


Quality of mCPR vs. CPR
Outcomes of mCPR vs. CPR

ASPIRE Trial, 2006
Worse neuro status
Trend to worse survival
Possibly negatively impacted by one study site

LINC Trial, 2013
= quality
vs High quality CPR

CIRC Trial, 2014
= quality
vs High quality CPR

Meta-analysis/Systematic Reviews

<table>
<thead>
<tr>
<th>Meta-analysis/Systematic Reviews</th>
<th>Setting</th>
<th>Summary Statement</th>
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<tbody>
<tr>
<td>Li, et al. Scand J Trauma Resusc Emerg Med 2016;24:1-10</td>
<td>OHCA and IHCA</td>
<td>mCPR cannot be recommended as a replacement for CPR, but rather a supplemental treatment in an overall strategy for treating cardiac arrest patients. Heterogeneity suggests the treatment effect might not be the same for each device compared to CPR:</td>
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<tr>
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<td>• Decreased rate of ROSC with LDB device</td>
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<td>• Non-significant effect on rate of ROSC with piston device</td>
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<td>• No device-specific treatment effect for survival to hospital admission or discharge</td>
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<td>• Similar treatment effect for mCPR and CPR for neuro status at discharge</td>
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<td>• Non-significant increased likelihood of good CPC with any type of device</td>
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Comparing the Research...
Resuscitation Logic

mCPR = HQ CPR & Mobile CPR = mCPR ≥ Mobile CPR

Other reasons to implement mCPR?

THINK SAFETY FIRST

Operational Considerations of mCPR for HEMS Programs
Device Characteristics & Aircraft Stowage

Patient Selection for HEMS mCPR

SHOCK STEMI ECMO
ROSC RVF DROWNING
TRAUMA HYPOTHERMIA

Deployment Considerations

- Patient size
- Cabin configuration
- Number of staff needed to apply device
- Stowage location

Apply before you fly!
One HEMS program’s experience with mCPR

NMH Air Care
- 9 aircraft (Agusta Grands) stationed at 7 bases
- Medical retrieval and scene flights
- Piston-style mCPR device on all aircraft since 01 Apr 2015
  - Several cases of mCPR in-flight using ground service’s device prior to on-board deployment
  - Our entire ground and air service utilizes the same mCPR device (87 units deployed)

Our mCPR Deployment Criteria
- Indications:
  - All ROSC patients: Apply preflight
  - Crew discretion: Apply preflight vs in-flight
    - Unstable STEMI (independent of LOC)
    - Severe shock from any cause
Our mCPR Deployment Criteria

- Unanticipated in-flight cardiac arrest:
  1. Initiate manual CPR and ACLS
  2. Assess distance to destination facility
  3. Assess ability to safely execute an unscheduled landing
  4. Balance possible benefit of providing safer/more effective mCPR vs possible harm of delaying arrival at definitive care

Our mCPR Deployment Criteria

- Contraindications:
  - Patient is too large for device
  - Patient is too small for device

Our Utilization of mCPR

- 4,538 transports
- 148 applications
- 84 activations
- 1.8% patients received mCPR
- 57% applications resulted in mCPR activation
Twitterverse view of HEMS using mCPR

Special thanks to NAEMSP Twitter guru, Dr. Joelle Donofrio @PEMEMS

Where in the world does HEMS use mCPR?

Some pins may represent areas where multiple HEMS services are using mCPR devices. This data is based on Twitter responses Nov-Dec 2017. Map possibly under-represents actual HEMS mCPR use.

Is your program missing?? Not added to the map by tweeting your service's location w/ @PEMEMS

Summary

Next year at NAEMSP: Emerging CPR techniques

K-9 CPR

Sponsored by:
Resources:

STEMI ➔ arrest


ROSC ➔ RA


CPR quality in Ground transport


CPR quality in HEMS transport


Resources:


Resources:

Meta-analysis/Systematic Reviews
