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Centre for  
**PREHOSPITAL RESEARCH**

# **WHAT MAKES AN IDEAL MECHANICAL CHEST COMPRESSION DEVICE FOR USE IN ADULT OUT-OF- HOSPITAL CARDIAC ARREST (OHCA)?**

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# **DISCLOSURES / CONFLICTS OF INTEREST**

**This study received no commercial sponsorship and the author has no conflict of interest to declare**

# WHAT'S THE DEAL WITH PRE-HOSPITAL CPR?

- High quality CPR is associated with improved outcomes in OHCA<sup>1</sup>.
- CPR quality sub-standard both before and during transport<sup>2</sup>.
- Chest compressions not delivered up to 50% of the time<sup>3</sup>.
- “Hands off” time increases during transport<sup>4</sup>.

1. Roosa JR, Vadeboncoeur TF, Dommer PB, *et al.* **CPR variability during ground ambulance transport of patients in cardiac arrest**, *Resuscitation*, 2012 Nov 21; [Epub ahead of print]

2. Ødegaard S, Olasveengen T, Steen PA, Kramer-Johansen J. **The effect of transport on quality of cardiopulmonary resuscitation in out-of-hospital cardiac arrest**, *Resuscitation*, 2009 Aug; 80 (8): 843-848

3. Wik L, Kramer-Johansen J, Myklebust H, *et al.* **Quality of cardiopulmonary resuscitation during out-of-hospital cardiac arrest**, *JAMA*, 2005 Jan 19; 293 (3): 299-304

4. Olasveengen T, Wik L, Steen PA. **Quality of cardiopulmonary resuscitation before and during transport in out-of-hospital cardiac arrest**, *Resuscitation*, 2008 Feb; 76 (2): 185-190

# RESEARCH QUESTION

**"Which of three mechanical chest compression devices do paramedics perceive as being most easy to use in the pre-hospital / ambulance service environment on victims of out-of-hospital cardiac arrest?"**

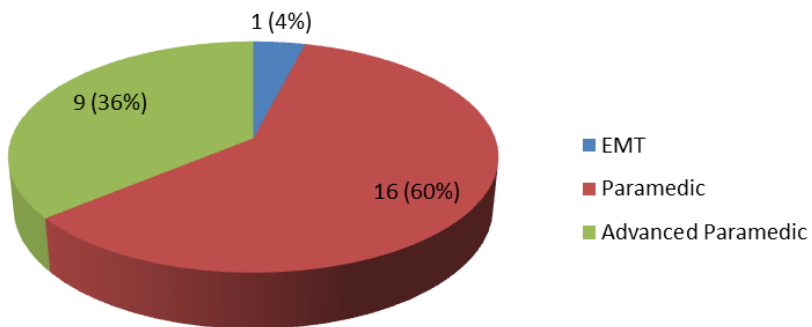


# PARTICIPANT DEMOGRAPHICS



- 25 participants (21 males; 4 female)
- Majority (44%) were aged 26–35 years
- Most (56%) had 6-15 years experience in EMS
- 40% had no previous experience with m-CPR

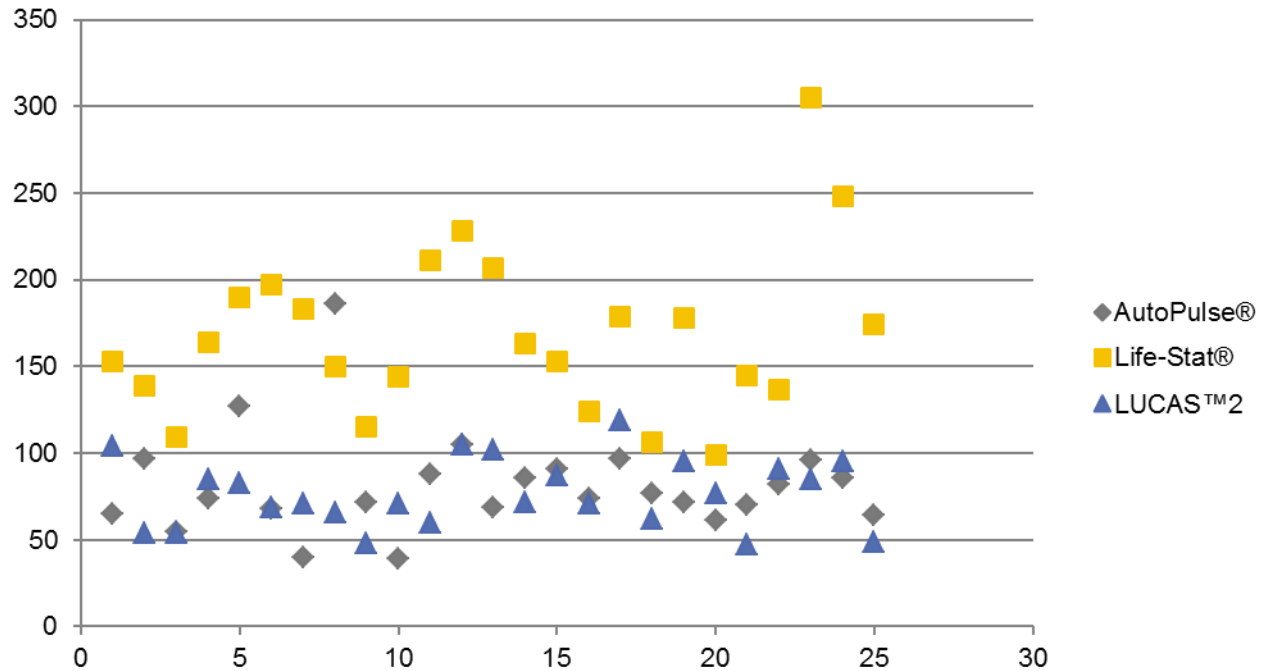
Operator's Clinical Role within NAS



# **METHODOLOGY**

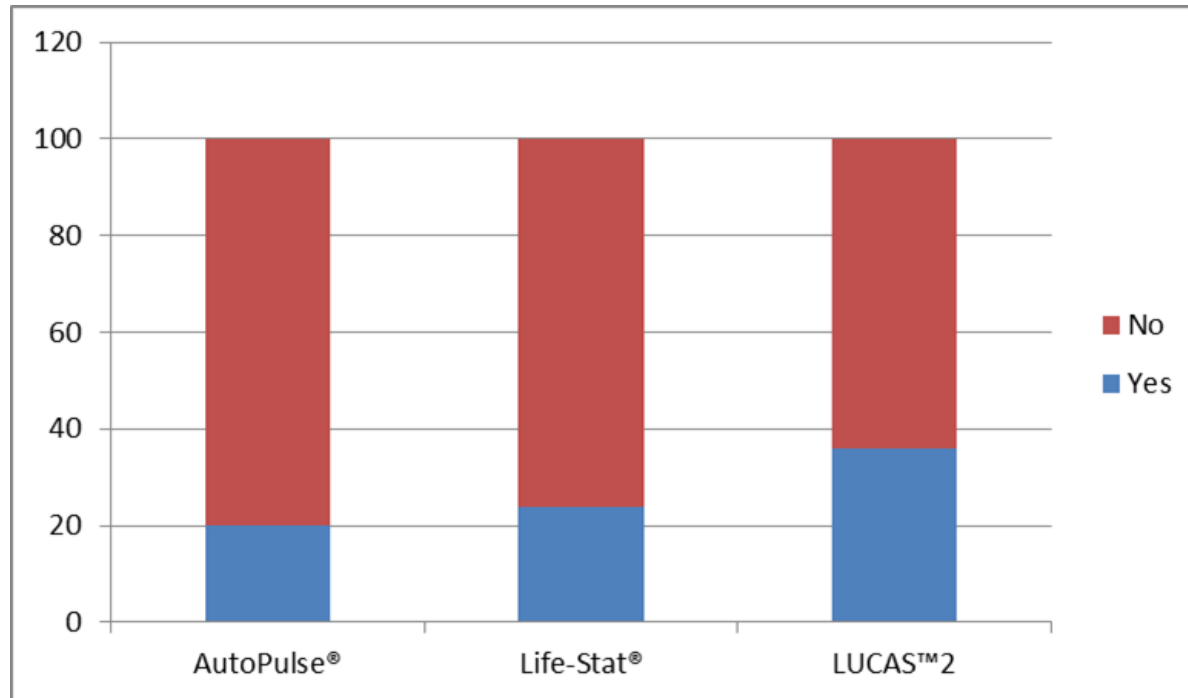
- 1. Participants received standardized instruction (video observation) in device assembly and implementation of m-CPR**
- 2. Initiated m-CPR on a simulated adult victim of OHCA (Laerdal Resusci Anne<sup>®</sup> SkillReporter<sup>™</sup> CPR training manikin)**
- 3. Assembly times recorded using stopwatch**
- 4. Completed retrospective questionnaire regarding their experience**

# M-CPR DEVICE ASSEMBLY TIMES



	Mean	Standard Deviation	Range (Min-Max)
AutoPulse®	82 seconds	±29.19 seconds	39-186 seconds
Life-Stat®	168 seconds	±47.65 seconds	99-305 seconds
LUCAS™2	77 seconds	±19.8 seconds	47-119 seconds

# ASSISTANCE REQUIRED WITH SET-UP



**Although participants rated LUCAS™2 highly in the post-evaluation survey, more required assistance with implementing m-CPR successfully**



# ACCEPTANCE OF M-CPR

**Overwhelmingly positive response to implementation of m-CPR:**

*“I strongly believe that every ambulance should carry a mechanical CPR device(s)”*

**– Paramedic (Mid-West)**

*“With the continuing emphasis on high-quality continuous CPR being a must, serious thought has to be given to the widespread provision of mechanical CPR devices on NAS vehicles.”*

**– Advanced Paramedic (Mid-West)**

# CONSIDERATIONS

- **Complexity of assembly**
- **Device propulsion (battery vs. gas powered)**
- **Upsetting for witnesses (family, friends, etc.)**
- **Patient movement with device in situ**
- **On-going revalidation to maintain competency in operation of the device**

# PARTICIPANTS' RANKING OF M-CPR

	First	Second	Third
AutoPulse®	5 (20 %)	13 (52 %)	7 (28 %)
Life-Stat®	3 (12 %)	4 (16 %)	18 (72 %)
LUCAS™2	17 (68 %)	8 (32 %)	0 (0 %)

## Conclusions:

- **LUCAS™2 m-CPR device was preferred by participants in this study for use in the pre-hospital / ambulance environment**
- **As m-CPR becomes more widespread in EMS, opinions and attitudes of providers regarding ease of deployment and use should be considered**

# STUDY LIMITATIONS

- **Small sample size**
- **Didn't look at integration of device into existing procedures at OHCA**
- **Review participants skills retention in device assembly, along with device preference after a defined interval**
- **Current clinical evidence for use of m-CPR remains poor<sup>5-6</sup>.**
- **Large scale RCT in pre-hospital use of AutoPulse<sup>®</sup> (CIRC) and LUCAS<sup>™</sup>2 (LINC) have yet to publish**

5. Ong ME, Mackey KE, Zhang ZC, *et al.* **Mechanical CPR devices compared to manual CPR during out-of-hospital cardiac arrest and ambulance transport: a systematic review**, *Scandinavian Journal of Trauma, Resuscitation & Emergency Medicine*, 2012 Jun 18; 20: 39
6. Brooks SC, Bigham BL, Morrison LJ. **Mechanical versus manual chest compressions for cardiac arrest**, *Cochrane Database of Systematic Reviews*, 2011 Jan 19; (1): CD007260
7. Fox J, Fiechter R, Gerstl P, *et al.* **Mechanical versus manual chest compression CPR under ground ambulance transport conditions**, *Acute Cardiac Care*, 2013 Mar; 15 (1): 1-6

*THE WAR BEGINS JULY 2*

**WHAT'S IN THE FUTURE?**



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# STUDY RECOMMENDATIONS

- **m-CPR is not about man vs. machine**
- **It's about integrating machines into pre-hospital practice to perform CPR – Something human beings have trouble doing efficiently and safely**
- **Devices must be:**
  - ✓ **Easy to carry**
  - ✓ **Easy to assemble**
  - ✓ **Intuitive to operate**
  - ✓ **“User Friendly”**

# **THANK-YOU VERY MUCH!**

- **Questions?**
- **Comments?**

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