LINC - A multicenter, randomized trial comparing a mechanical CPR algorithm using LUCAS vs. Manual CPR in out-of-hospital cardiac arrest patients

Sten Rubertsson, Professor
Department of Anaesthesiology and Intensive Care,
Uppsala University, Sweden
Conflict of Interest

PI for the LINC study
Consultation/Advisory-Physio-Control
Thank you!!!

Authors;
Erik Lindgren, M.D., David Smekal, M.D., Ollie Östlund, Ph. D., Johan Silfverstolpe, M.D., Robert A. Lichtveld, M.D., Ph.D., Rene Boomars, M-PA., Björn Ahlstedt, M.D., Gunnar Skoog, M.D., Robert Kastberg, M.D., David Halliwell, R.N., Martyn Box, R.N., Johan Herlitz, M.D., Ph.D., Rolf Karlsten, M.D., Ph.D.

The LINC study group;
LINC - from 2008 to 2013

2,300,000 population covered

>1,500 in-hospital employees trained or informed

771 paramedics trained, twice a year

889 quality tests performed with paramedics

115 LUCAS devices in use

26 ambulance stations

14 hospitals
What is LINC?

A multicenter, randomized, controlled trial designed to evaluate the efficacy and safety of:

LUCAS concept for resuscitation of OHCA including defibrillation during ongoing compressions vs. manual CPR according to 2005 guidelines.
Objectives

Primary

- Superiority in 4-hr survival

Secondary

- Survival upto 6 month with good neurological outcome CPC 1-2
LUCAS 2™

Mechanical Compression-Decompression

- Electricity-battery
- 100 compressions/min
- 4-5 cm compression depth
- Complete chest recoil
- 50/50 duty cycle
- Allows defibrillation when running
Inclusion criteria

- Unexpected adult out-of-hospital cardiac arrest where an attempt of resuscitation is considered appropriate
Exclusion criteria

- Traumatic cardiac arrest, including hanging
- Age believed to be < 18 years
- Known pregnancy
- Patients body size not fitting the LUCAS
- Defibrillated before LUCAS arrives at scene
  - crew witnessed VF/VT with ROSC
Screening in LINC

4,998 cardiac arrests

2,593 included (51.9%)

Dead on arrival
1,144 (22.9%)

Logistics
436 (8.7%)
Defibrillated before arrival
337 (6.7%)
Trauma
192 (3.8%)
LUCAS did not fit
74 (1.5%)
< 18 year

1,300 L-CPR (LUCAS)
1,289 M-CPR (Manual)

*4 pts did not provide informed consent
Study Algorithms

**LUCAS CPR algorithm (L-CPR)**

- Defibrillate *during* LUCAS compressions: 90 seconds; defibrillate x 1; 90 seconds
- Stop for rhythm analysis
  - VF/VT: Defibrillate *during* LUCAS compressions (90 s, def, 90 s)
  - Asystole/PEA: 3 min of LUCAS compressions

**Manual CPR algorithm (M-CPR)**

- Guidelines for CPR 2005; 2 minutes of manual compressions
- Stop for rhythm analysis
  - VF/VT
  - Asystole/PEA: Defibrillate
  - 2 minutes of manual compressions
Background variables

L-CPR

M-CPR
Age (mean)
69.0 y.o
69.1 y.o
Sex-male
67%

67%
Primary outcome

4-hour survival

Risk difference -0.05%
95% C.I. -3.32 – 3.23, p=1.00

<table>
<thead>
<tr>
<th>4-hour survival</th>
<th>L-CPR (N=1300)</th>
<th>M-CPR (N=1289)</th>
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<tbody>
<tr>
<td>Risk difference</td>
<td>23.6%</td>
<td>23.7%</td>
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</table>
### Outcome

<table>
<thead>
<tr>
<th>Event</th>
<th>L-CPR (N=1300)</th>
<th>M-CPR (N=1289)</th>
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<tbody>
<tr>
<td>4-hour survival</td>
<td>23.6%</td>
<td>23.7%</td>
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<tr>
<td>ICU discharge (CPC 1-2)</td>
<td>7.5%</td>
<td>6.4%</td>
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<tr>
<td>Hospital discharge (CPC 1-2)</td>
<td>8.3%</td>
<td>7.8%</td>
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<tr>
<td>At 1 month (CPC 1-2)</td>
<td>8.1%</td>
<td>7.3%</td>
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<tr>
<td>At 6 months (CPC 1-2)</td>
<td>8.5%</td>
<td>7.6%</td>
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Secondary outcome and CPC in all survivors

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</thead>
<tbody>
<tr>
<td>ICU discharge</td>
<td>62.0%</td>
<td>54.3%</td>
<td>92.3%</td>
<td>86.2%</td>
<td>93.8%</td>
<td>87.0%</td>
<td>99.1%</td>
<td>94.2%</td>
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<tr>
<td>Hospital discharge</td>
<td>38.0%</td>
<td>45.7%</td>
<td>7.7%</td>
<td>13.8%</td>
<td>6.3%</td>
<td>13.0%</td>
<td>0.9%</td>
<td>5.8%</td>
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<tr>
<td>At 1 month</td>
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<tr>
<td>At 6 months</td>
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- Poor neurological outcome (CPC 3-4)
- Good neurological outcome (CPC 1-2)
Conclusions

- Mechanical chest compressions using the LUCAS device in combination with defibrillation during ongoing compressions provided no improved 4-hour survival compared to conventional manual chest compressions in out-of-hospital CA patients.

- There was good neurologic outcome in the vast majority of the survivors in both groups.
• Thus, in clinical practice CPR with the LUCAS device and defibrillation during ongoing compressions seems to have similar effectiveness as manual chest compressions.