Verbesserung der CPR mithilfe von Feedbacksystemen


Aus Aktualitätsgründen haben wir die Abstracts der Studie in englischer Sprache veröffentlicht. Bei Fragen stehen wir gerne unter + 49 89-864954-0 oder info@laerdal.de zur Verfügung.

Die Utstein Überlebensformel

Medical themes:

Increased survival with more emphasis on CPR

In Seattle¹, Rea found that VF survival increased from 33% to 46% with the introduction of a new protocol using a single shock with no rhythm reanalysis or post-defibrillation pulse checks, and extended the period of cardiopulmonary resuscitation from 1 to 2 minutes. This protocol, which is similar to Guidelines 2010, significantly increased the time for CPR vs defibrillation.

CPR – much more than buying time for defibrillation

Eilevstjønn and Rea evaluated 1100 episodes of EMS treated cardiac arrest within ROC. Fifty percent of the patients who had the heart restarted were not defibrillated. For those discharged alive, one third were not defibrillated.(ERC2012) These findings underscore the importance of CPR for the treatment of shockable and non-shockable cardiac arrest.
High chest compression fraction is an independent determinant of survival in VF cardiac arrest

Christensen and coworkers from ROC analyzed 506 cases and found highest survival when chest compression fraction was between 61 and 80%.

Chest compression fraction is important for non-VF patients

Vaillancourt\textsuperscript{2} found a trend to increased ROSC with increasing chest compression fraction for non-VF patients.

Poor chest compressions does not circulate adrenaline

EMS, trained to Guidelines 2000, used a chest compression depth of only 34mm and a chest compression fraction of only 50\% according to Wik\textsuperscript{3}. When this treatment was given to laboratory pigs, no hemodynamic effect of adrenaline could be detected.

Short chest compression pauses does not reduce blood pressure

Contrary to the previous animal studies, this study in humans demonstrates that blood pressures achieved before the rhythm analysis pause do not necessarily decrease after the pause but may even increase if the duration of the pause is under ten seconds and the quality of CPR is good both before and after the pause.\textsuperscript{4}

Leaning is common and affect patient outcome

Fried\textsuperscript{5} found incomplete release in 91\% of the patient cases and in 12\% of all pediatric chest compressions. According to Zuercher\textsuperscript{6}, leaning impairs both cardiac output and myocardial blood flow during cardiac arrest.

The importance of chest compression depth

Suboptimal compression depth was found in half of patients by 2005 guideline standards and almost all by 2010 standards as well as an inverse association between compression depth and rate. A strong association between survival outcomes and increased compression depth could be demonstrated, but no clear evidence to support or refute the 2010 recommendations of >50 mm\textsuperscript{7}.

Guidelines 2010 require doubling of compression force.

In a study by Wik\textsuperscript{3}, average compression depth without feedback was 34mm and applied force for 34mm depth is about 25kg according to Nysaether\textsuperscript{8} and Tomlinson\textsuperscript{9}. With guidelines 2010, 50mm chest compression depth will require a force of at 50kg for the average patient.

CPR Meter is safe

Zuercher\textsuperscript{10} found that devices like the CPR Meter do not impair hemodynamics during piglet CPR.

CPR is safe for victims not in cardiac arrest

ILCOR\textsuperscript{11} state that serious complications among non-arrest patients receiving dispatch-assisted bystander CPR occurred infrequently. Of 247 non-arrest patients with complete follow-up who received
chest compressions from a bystander, 12% experienced discomfort; only 5 (2%) suffered a fracture; and no patients suffered visceral organ injury.

Education themes:

CPR feedback devices is recommended during training

A review by Yeoung\textsuperscript{12} provides good evidence supporting the use of CPR feedback/prompt devices during CPR training as a strategy to improve CPR skill acquisition and retention. The review include a VAM study by Wik\textsuperscript{13} where subjects who received first 1 initial plus 5 short training sessions shortly thereafter performed better during skill retention testing than those who only received 1 initial training. Oermann\textsuperscript{14} found that monthly training with a VAM feedback resulted in superior performance vs annual training. These studies supports our strategy of low dose, high frequency training.

CPR feedback devices offer just in time training

Another study by Wik\textsuperscript{15} randomized participants to do 3 min CPR on a manikin, both with and without VAM feedback. The group who did CPR first with feedback performed better than the group without feedback. Interestingly, the group who received feedback first continued to perform at least as good when feedback was turned off. This study supports our strategy that feedback can facilitate just in time training.

Implementation themes:

Decay in EMS chest compression quality due to fatigue is rare

Half of the providers compressed the chest according to guidelines depth in this study of EMS prolonged resuscitation. Chest compression decay and thereby fatigue within the first two minutes was rare, suggesting that the paramedics were capable of performing good chest compressions but they did not know how hard to push\textsuperscript{16}.

QCPR improved CPR

Real-time visual and audible feedback by MRx with QCPR altered performance to more closely conform with guidelines.\textsuperscript{17} However, since there was little room for improvement in CPR quality by these EMS systems (Pittsburgh and Seattle), no improvement in patient outcomes could be detected.
Compression quality is better with CPR meter

A study by Skorning evaluated CPR Meter. Depth improved from 45% correct to 73% correct and rate improved from 64% to 95% correct. Leaning improved from 4.4% to 0.2%.

QCPR feedback improve leaning

Niles found that automated feedback helped reduce leaning from 50% to 27% of all chest compressions in a series of in-hospital pediatric arrest.

Compression quality is better with a combination of feedback and debriefing.

The combination of feedback and debriefing improved compression rate compliance from 45% to 84% and resulted in a doubling of participants providing compressions of both adequate rate and depth, from 29% vs. 64%.

Patient outcome is better with a combination of feedback and debriefing.

This study by Edelson report an increase in ROSC, a decrease in ventilations per minute and an increase in chest compression depth when MRx with QXPR was complemented with debriefing.

Feedback is also helpful in helicopter and moving ambulance

Real time automated feedback improves certain aspects of CPR quality in flying helicopters and moving ambulance vehicles. The effect of feedback guidance was most pronounced for chest compression rate.

Voice prompts in addition to audiovisual feedback did not add value.

In this clinical trial, compression depth and rate, as well as survival was good both with and without voice prompts in addition to visual feedback and a metronome.

QCPR require mattress compression

When CPR is performed in a bed, mattress compression and hence accelerometer error is was 13mm. When a stretcher was used, the error was 4mm. These data suggest that about 15mm must be added for CPR in a bed, according to Monsieurs.

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Helge Myklebust, August 2012
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