The Transport In Medical Emergency - Simulation Study (TIME-Sim)

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Background and Objective

Extracorporeal cardiopulmonary resuscitation (eCPR) is a promising therapy for selected patients suffering from cardiac arrest (CA). A time period of 60 minutes from onset of CA until start of eCPR, appears to be a predictor of survival. In urban areas the most time-consuming and probably modifiable part is the Scene Time Interval (STI).

The purpose of this study was to find out, if a time-optimized CPR-management is able to reduce the STI, without affecting the quality of CPR.

Methods

We carried out a prospective CA manikin simulation study including 4 different emergency medical service (EMS) teams (each staffed with one emergency physician). Each team passed 6 CA simulations as demonstrated in figure 1.

In the control arm scenario of the CA simulation the EMS teams followed the standard ERC advanced life support (ALS) algorithm.

Then each team had a short introduction to a "time optimized CA scene strategy" - the intervention. It is basically based on immediate patient transfer onto a spineboard at the CA scene followed by ERC ALS standards and mechanically CPR usage as early as possible.

Further two CA simulation were passed by the teams applying the new strategy.

For further testing each team passed one control arm scenario as well as one intervention arm scenario one week later.

Figure 1: Sequence of Scenarios

Figure 2: Load and go

Conclusion

By using a time-optimized strategy with focus on early transport it was possible to significantly reduce the STI enabling selected patients being treated with eCPR at a time point with higher odds for success.

References

Karagiannis, C., et al., Extracorporeal membrane oxygenation: evolving epidemiology and mortality, *Intensive Care Med*, 2016, 42(5): p. 889-896; Wengemayer, T., et al., Influence of low-flow time on survival after extracorporeal cardiopulmonary resuscitation (eCPR), *Crit Care*, 2017, 21(1): p. 157; Kim, K.H., et al., Scene time interval and good neurological recovery in out-of-hospital cardiac arrest, *Am J Emerg Med*, 2017, 35(1): p. 1682-1690; Debatty, G., et al., Prognostic factors for extracorporeal cardiopulmonary resuscitation recipients following out-of-hospital refractory cardiac arrest: A systematic review and meta-analysis, *Resuscitation*, 2017, 112: p. 1-10; Hultin, A., et al., Early eCPR for out-of-hospital cardiac arrest: Best practice in 2018, *Resuscitation*, 2018, 130: p. 44-48; Ortega-Gubillon, et al., Extracorporeal resuscitation for refractory out-of-hospital cardiac arrest in adults: A systematic review of international practices and outcomes, *Resuscitation* 101 (2016) 12-20; Yanoopoulos, D., et al., Quality of CPR: An important effect modifier in cardiac arrest clinical outcomes and intervention effectiveness trials, *Resuscitation*, 2015, 96: p. 106-113; Martine E. Bol, et al., Early initiation of extracorporeal life support in refractory out-of-hospital cardiac arrest: Design and rationale of the INCEPTION trial, *Yonq* (2018)

Results

There was a significant reduction of the STI in the intervention arm (14:28 +/- 01:19 vs. 22:06 +/- 04:35, p=.001). Further there was a significantly earlier use of mechanical CPR (1:10 +/- 00:27 vs. 2:56 +/- 1:40, p=.004) and earlier start of transport to the ambulance car (6:10 +/- 1:27 vs. 12:44 +/- 3:30, p=.001). Almost all parameters of quality of CPR did not differ between intervention and control scenarios (table 2).

Figure 3: STI Control vs. Intervention Scenarios

Figure 4: STI per Scenario

	Control	Intervention	P-Value
Time to mechanical CPR	02:56 (01:40)	01:10 (00:27)	.004
Time to decision to transport	04:30 (02:14)	02:13 (00:54)	.005
Time to rescue	12:44 (03:30)	06:10 (01:27)	.001

Table 1: Possible reasons for shorter STI

	Control	Intervention	P-Value
Time to first shock (mm:ss)	01:24 (00:25)	01:27 (00:24)	.820
Compression fraction (%)	0,83 (0,03)	0,82 (0,02)	.695
Mean no flow time (s)	10 (4)	8 (2)	.326
Mean compression depth (mm)	54 (9)	51 (8)	.481
Mean compression rate (bpm)	107 (2)	109 (1)	.055
Percentage of right position (%)	96 (6)	77 (13)	.007
Mean tidal volume (ml)	305 (44)	370 (75)	.074

Table 2: Data of CPR quality detected by manikin during treatment at scene as on transport