



Associations of Chest Compression Release Velocity and Age, Weight, and Gender During Cardiac Resuscitation

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Background:

- High chest compression release velocity (CCRV) has been independently associated with improved survival from out-of-hospital cardiac arrest (OHCA).
 - Kovacs et al, Resuscitation. 2015;92:107-114.*
- Previous studies demonstrate that the amount of force required to achieve equal compression depth varies significantly between patients suggesting that patient-related factors influence compression dynamics.
 - Tomlinson et al, Resuscitation. 2007;72:364-370.*
- The aim of our study was to evaluate associations between CCRV and OHCA patient age, weight, and gender.

Methods:

Study Setting:

- Data were supplied by 2 EMS agencies in Arizona between 10/2008 and 12/2016 that participate in Save Hearts in Arizona Registry and Education (SHARE) program.

Study Design:

- We conducted a retrospective observational cohort study of prospectively collected data.

Data Collection:

- Chest compression quality, including CCRV, was obtained from defibrillators (E Series and X Series; ZOLL Medical, Chelmsford, MA) equipped with accelerometer-based technology.

Inclusion Criteria:

- Adult OHCA ≥ 18 years old.

Statistical Analysis:

- The subject-level mean CCRV was calculated for the first 10 minutes, then separately for the first five minutes and the second five minutes.
- Mean CCRV was summarized within each subgroup by the median and inter-quartile range, and were compared across subgroups by the Kruskal-Wallis test.

Results:

2,661 OHCA cases (Between 10/1/2008 and 12/31/2016)

Exclusions:

- Pediatric patients or unknown age (126)
- Non-cardiac or unknown etiology (518)
- Medical facility or unknown OHCA location (415)
- Arrest after EMS arrival (98)
- EMS did not attempt resuscitation (63)
- Care terminated on DNR (15)
- No CPR quality data (264)
- Fewer than 20 compressions or duration of compressions less than 1 minute (22)

1,140 cases remaining for analysis

- The 1,140 cases received a total of 852,963 compressions with a median of 790 compressions per subject (IQR 689.5, 858).
- The median duration of compressions was 8.70 minutes (IQR 8.0, 9.1) per subject.
- Mean CCRV was negatively correlated with age and positively correlated with weight (Table 1).
- Mean CCRV was greater in male patients compared to female patients [344.4 mm/s (IQR 307.3-384.6) vs. 331.5 (285.3-385.5), p=0.0133]

Limitations

- As an observational study we cannot claim causality.
- Patient characteristics may have influenced rescuer performance which then might have contributed to the observed differences in CCRV.
- The measurement of CCRV by the accelerometer may be affected by the release of other compressible surfaces (beds or EMS stretchers) beneath the patient.

CCRV (mm/s)

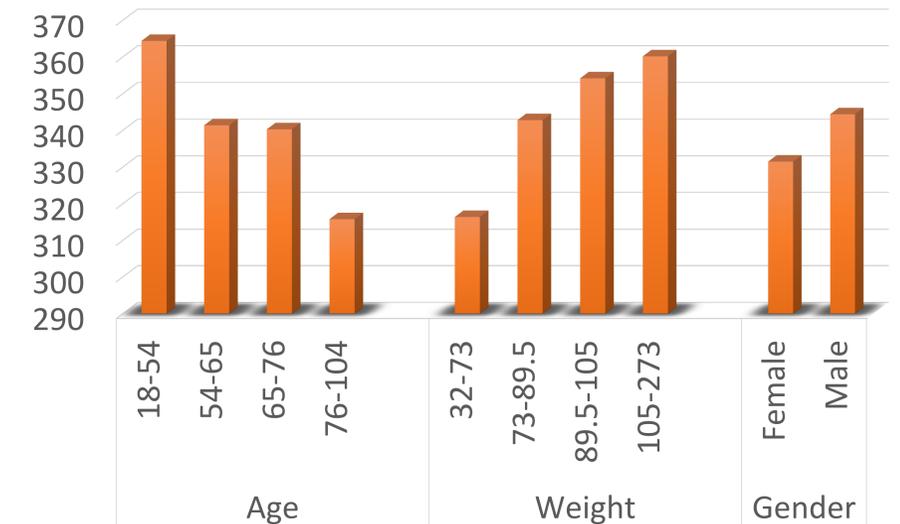


Table 1. Mean CCRV comparison according to patient age, weight, and gender

Variable	Category	n (%)	Mean CCRV	p-value
Gender	Female	385 (33.8%)	331.5 (285.3, 385.5)	0.0133
	Male	755 (66.2%)	344.4 (307.3, 384.6)	
Age quartile	[18,54]	300 (26.3%)	364.4 (323.1, 407.5)	< 0.0001
	(54,65]	286 (25.1%)	341.4 (300.4, 388.6)	
	(65,76]	272 (23.9%)	340.3 (298.2, 379.1)	
	(76,104]	282 (24.7%)	315.8 (282.5, 362.6)	
Weight quartile (kg)	[32,73]	234 (20.5%)	316.4 (272.6, 367.7)	< 0.0001
	(73,89.5]	188 (16.5%)	342.8 (308.4, 388.2)	
	(89.5,105]	213 (18.7%)	354.2 (312.8, 395.1)	
	(105,273]	209 (18.3%)	360.2 (317.3, 409.8)	
	Unknown	296 (26%)	334 (295.4, 376.8)	

Conclusion:

- Patient characteristics including younger age, male gender, and increased weight were associated with a higher CCRV during OHCA resuscitation.
- Further studies may help to determine the significance of these findings with regard to outcomes.