The Effects of Hand Placement on Chest Compression Quality in Infants and Young Children: Initial Findings from the Videography in Pediatric Emergency Research (VIPER) Collaborative

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TAKE HOME POINTS:

- Poor quality CPR is common, considered a preventable harm[1]
- Only 12.9% of overall compression segments met AHA "high-quality" recommendations
- The two-thumb encircling technique for infant CPR improves compression rate

OBJECTIVE

To combine video review and monitor-defibrillator data to determine the effects of hand placement on chest compression quality during cardiac arrest in infants and young children.

INTRODUCTION

- Approximately 16,000 children suffer cardiac arrest per year
- High-quality CPR is critical for optimizing patient outcomes[1]
- Small, single site studies suggest that two-thumb encircling (2T) compressions are more effective for infant CPR than two finger (2F) [2] and one-handed (1H)[3].

2015 AHA BLS RECOMMENDATIONS

- Rate of 100-120 compressions per minute (cpm)
- Compress to adequate depth
  - 2.0 to 2.4 inches for patients ≥ 1 years
  - 1.5 to 2.0 inches for patients < 1 years
- Hand placement

	One Rescuer	Two Rescuers
Infant	Two finger (2F)	Two-thumb encircling (2T)
Child	One or two handed (1H or 2H); provider judgment	One or two handed (1H or 2H); provider judgment

METHODS

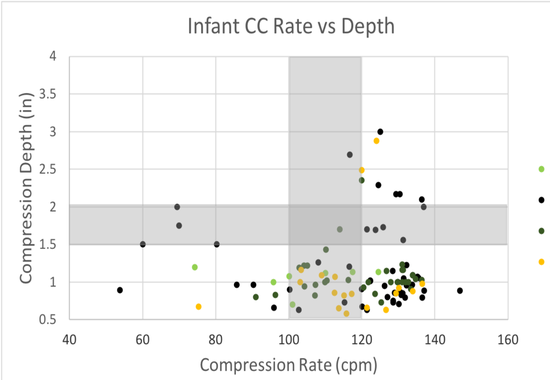
- Prospective observational study of pediatric cardiac arrests presenting to 3 PEDs in the VIPER collaborative with data collected by video review
- CPR segment defined as period of chest compressions performed by single provider
  - Hand position documented as technique used for majority of each compression segment
  - CPR segment designated as "high-quality" if AHA rate and depth guidelines achieved
- χ^2 analysis was used to analyze relationships between compression technique and adherence to rate and depth standards

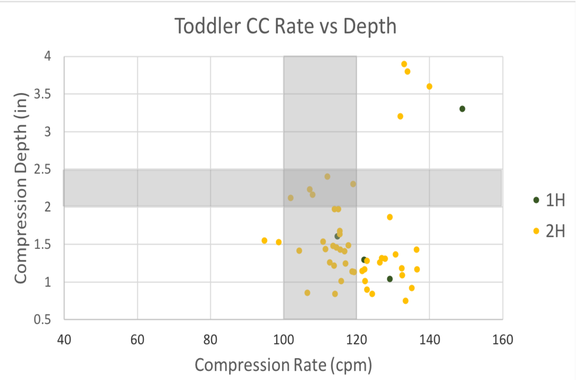
RESULTS

- 248 minutes of CPR during 19 patient events were analyzed (14 infants, 5 toddlers)
- 12.9% of all segments met criteria for both rate and depth

	% Segments with Appropriate Rate	% Segments with Appropriate Depth
Infant	30.6%	6.5%
Toddler	52.4%	31.1%

- In infants, the 2T technique was significantly associated with adherence to AHA standards for rate (2T rate χ^2=4.97; 2T depth χ^2=3.64)





	INFANT			TODDLER		
	Compression Time (minutes)	Median rate, cpm (SD)	Median depth, in (SD)	Compression Time (minutes)	Median rate, cpm (SD)	Median depth, in (SD)
2F	8.1	113 (5)	0.93 (0.21)	--	--	--
2T	65.2	117 (23)	0.96 (0.37)	--	--	--
1H	53.8	126 (14)	1.16 (0.73)	5.6	126 (14)	1.46 (0.33)
2H	29.6	132 (5)	0.97 (0.18)	69.2	118 (14)	1.35 (0.40)
P-Value		0.003**	0.084		0.475	0.472

Results not compliant with AHA recommendations

CONCLUSIONS

- CPR during pediatric cardiac arrest rarely met AHA "High-Quality" recommendations.
- The 2T technique is preferred in infants for achieving adequate compression rate
- Further investigation of factors affecting chest compression depth in pediatric patients is needed

REFERENCES

[1]American Heart Association, Get With the Guidelines-Resuscitation QI Program; [2]Jiang J et al. Am J Emerg Med 2015; [3]Jang HY et al. Resuscitation 2018

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