

Paramedic CAT (Critically Appraised Topic)

Title: Prehospital double sequential defibrillation

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2nd Party Appraiser:

Clinical Scenario: Paramedics arrive on scene to find a 55 year old male in cardiac arrest. They attach their defibrillator pads in the anterior apex position and analyze the rhythm to be ventricular fibrillation. After one shock another crew arrives on scene and attaches their defibrillator pads to the patient in the anterior posterior position. After two minutes of CPR both crews analyze the rhythm, charge their defibrillators, and deliver both shocks almost simultaneously

PICO (Population - Intervention - Comparison - Outcome) Question:

Does double sequential external defibrillation improve chances of ROSC in patients in persistent or refractory ventricular tachycardia or ventricular fibrillation compared to single external defibrillation in the prehospital setting?

Search Strategy: ((ventricular tachycardia OR ventricular fibrillation OR shockable rhythms OR cardiac arrest) AND (double sequential external defibrillation OR dual defibrillation OR double defibrillation) AND (return of spontaneous circulation OR ROSC OR discharge OR conversion OR convert OR death))

* MEDLINE and CINAHL Plus were used*

Limits: Published Date: 20140101-20171231; Peer reviewed, English language

Search outcome:

10 results. Three were considered relevant for this mini CAT

Search #	Searched Terms	Results
S21	S17 AND S18 AND S19 Limiters - Published Date: 20140101-20171231; Peer reviewed; English Language	10
S20	S17 AND S18 AND S19	45
S19	S1 OR S2 OR S3 OR S4	102,970

S18	S5 OR S6 OR S7	486
S17	S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16	2,358,129
S16	"death"	867,833
S15	"decreased mortality"	68,460
S14	convert	40,763
S13	"conversion"	181,938
S12	"discharge"	220,907
S11	"survival"	1,095,282
S10	"positive outcomes"	192,677
S9	"ROSC"	2,001
S8	"return of spontaneous circulation"	2,940
S7	"double defibrillation"	185
S6	"dual defibrillation"	309
S5	"double sequential external defibrillation"	10
S4	"cardiac arrest"	38,727
S3	"shockable rhythms"	477
S2	"ventricular fibrillation"	43,029
S1	"ventricular tachycardia"	41,878

Relevant papers:

Author, Date	Population: Sample Characteristics	Design (LOE)	Outcomes	Results	Strengths/Weaknesses
Cortez et al (2016)	12 patients were treated with pre hospital double sequential defibrillation - City of Columbus, division of fire	Retrospective chart review	- Return of spontaneous circulation. - Conversion from VF - Hospital discharge - Cerebral performance category score	- In 12 patients, return of spontaneous circulation was achieved in 3 (25%) - 9 patients were converted out of ventricular fibrillation - 3 patients were discharged - 2 patients received a good cerebral performance score	<u>Strengths</u> - Looked at multiple outcomes related to ROSC <u>Weaknesses</u> - Small sample size of 12 patients treated with double sequential defibrillation. This will give a higher percentage of ROSC then if the sample size was much larger - No comparison to single external defibrillation records
Ross et al (2016)	50 patients were treated with double sequential defibrillation - Large urban fire based EMS system out of hospital cardiac arrest database	Retrospective cohort analysis	- Neurologically intact survival defined as cerebral performance category score of 1 and 2 - ROSC - Survival to hospital admission - Survival to hospital discharge	- 3 patients had a successful score on the cerebral performance category - 14 patients had ROSC - 16 patients survived to hospital - 4 patients survived hospital discharge	<u>Strengths</u> - Took into account for many factors such as bystander CPR - Largest population size found <u>Weaknesses</u> - Observational study that is prone to selection bias - Large EMS system with many ALS medics. Ambulances are equipped with two defibrillators
Cabañas et al (2015)	10 patients were treated with double sequential external defibrillation - Urban/suburban emergency medical service system with a population of	Retrospective case series	- VF conversion - Survival to dispatch - ROSC	- Converted VF in 7 patients (70%) - 3 patients had ROSC - No patients survived to	<u>Strengths</u> - Recorded number of DSED shocks were delivered <u>Weaknesses</u> - Sample size was too small. Resulting in

	900,00			discharge	inaccurate data
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Comments: Difficulty resulted with this PICO as this is still a relatively new topic in prehospital care. Although the data was small, it did demonstrate that double sequential external defibrillation was able to convert VF >50% of the time in all three cases.

Consider:

Sample sizes in all three cases were very small. For more accurate results a much larger sample size is needed. More information about the arrest is also needed i.e.; drugs administered, transport time to ED, paramedic level of training, bystander CPR/AED.

Clinical bottom line:

There is not enough evidence for double sequential external defibrillation to change medical directives thus far. More research could however change the way prehospital care providers run cardiac arrests in the future.

References:

Cabañas, J. G., Myers, J. B., Williams, J. G., De Maio, V. J., & Bachman, M. W. (2015). Double Sequential External Defibrillation in Out-of-Hospital Refractory Ventricular Fibrillation: A Report of Ten Cases. *Prehospital Emergency Care, 19*(1), 126-130. doi:10.3109/10903127.2014.942476

Cortez, E., Krebs, W., Davis, J., Keseg, D. P., & Panchal, A. R. (2016). Use of double sequential external defibrillation for refractory ventricular fibrillation during out-of-hospital cardiac arrest. *Resuscitation, 108*82-86. doi:10.1016/j.resuscitation.2016.08.002

Ross, E. M., Redman, T. T., Harper, S. A., Mapp, J. G., Wampler, D. A., & Miramontes, D. A. (2016). Dual defibrillation in out-of-hospital cardiac arrest: A retrospective cohort analysis. *Resuscitation, 106*14-17. doi:10.1016/j.resuscitation.2016.06.011