

Comparison of Pediatric and Adult ECG Rhythm Analysis by Automated External Defibrillators during Out-of-hospital Cardiac Arrest

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The differences of pediatric vs. adult ECG characteristics have been quantified in a few comparative studies so far. Our study aims to assess these differences from the scope of the rhythm analysis in automated external defibrillators (AED) during out-of-hospital cardiac arrest (OHCA) interventions.

Pediatric and adult OHCA databases collected with a commercial AED (Fred Easy, Schiller Médical, France) in the region of Paris and suburban were analysed. The rhythm in 10s strips during AED analysis on noise-free ECGs was annotated as normal sinus rhythm (NSR), other non-shockable rhythm (ONR), asystole (ASYS), ventricular fibrillation (VF) in 2 databases: (1) Pediatric database (2010-2014) from 191 children (6 years median age), including 883 ECG strips: 39 NSR, 294 ONR, 508 ASYS, 42 VF. (2) Adult database (2011) from 742 patients, including 3690 ECG strips: 154 NSR, 1063 ONR, 2252 ASYS, 221 VF.

The performance of the shock advisory system (SAS) in AED was compared on the pediatric and adult databases (Table 1). Accuracy drop in children was observed – maximal for NSR (2.6%) and negligible for VF (0.7%), ONR (0.2%), ASYS (0.1%). The reason for such accuracy differences could be justified by statistics of the SAS rhythm analysis criteria (Figure 1). All criteria presented significant and largest differences just for NSR.

Table 1. SAS performance for different rhythms.

| | VF | NSR | ONR | ASYS |
|-----------|-----------------|----------------|-------------------|-------------------|
| Adult | 95.9% (212/221) | 100% (154/154) | 99.5% (1058/1063) | 99.9% (2250/2252) |
| Pediatric | 95.2% (40/42) | 97.4% (38/39) | 99.3% (292/294) | 99.8% (507/507) |

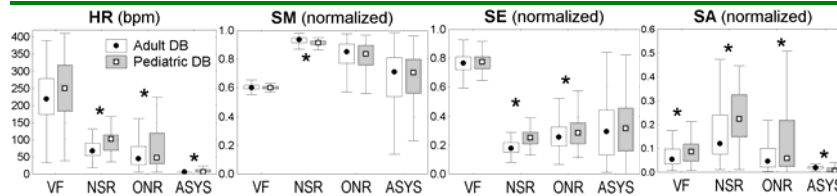


Figure 1. Box-Plot distributions (median, quartile range, non-outlier range) of 4 SAS criteria: heart rate (HR), signal amplitude (SA), deflections from signal mean (SM) and signal extrema (SE) in a narrow frequency band for QRS enhancement. *p<0.05: Significant differences of adult vs. pediatric rhythms.