 The SAC representative follows the CoSTR checklist instructions and submits the CoSTR, EtD and checklist to the SAC chair for approval. It is recommended that all CoSTRs and EtDs are peer reviewed by an independent SAC member prior to posting on ILCOR.org.

## Consensus on Science with Treatment Recommendations (COSTR) Template for [www.ilcor.org](http://www.ilcor.org) posting

## Single or stacked shocks for pediatric defibrillation PLS 4080.19 TF SR

*Note to Webmaster – this preamble about draft can be removed when you are notified by ILCOR that the CoSTR label of draft is no longer required.*

*This CoSTR is a final version prepared by ILCOR and is labelled “draft” to allow for public comments and to comply with copyright rules of journals. The ‘draft label’ will be removed from this website once a summary article has been published in a scientific journal.*

## Conflict of Interest Declaration

The ILCOR Continuous Evidence Evaluation process is guided by a rigorous ILCOR Conflict of Interest policy. The following Task Force members and other authors were recused from the discussion as they declared a conflict of interest: none applicable

The following Task Force members and other authors declared an intellectual conflict of interest and this was acknowledged and managed by the Task Force Chairs and Conflict of Interest committees: none applicable

## CoSTR Citation

Tiwari, T, del Castillo J, Acworth j, Gupta P, Scholefield B, de Caen A, on behalf of the International Liaison Committee on Resuscitation Pediatric Life Support Task Force. Single or stacked shocks for pediatric defibrillation - Paediatric Consensus on Science with Treatment Recommendations [Internet] Brussels, Belgium: International Liaison Committee on Resuscitation (ILCOR) Paediatric Advanced Life Support Task Force, 2024 October xxxxx. Available from: http://ilcor.org

**Methodological Preamble and Link to Published Systematic Review**

The continuous evidence evaluation process for the production of Consensus on Science with Treatment Recommendations (CoSTR) started with a systematic review (Tiwari, 2024, PROSPERO CRD42024559428) with involvement of clinical content experts. Evidence for pediatric literature was updated and considered by the Pediatric Life Support Task Force. Additional scientific literature was published after the completion of the systematic review and identified by the Pediatric Task Force and is described before the justifications and evidence to decision highlights section of this CoSTR. These data were taken into account when formulating the Treatment Recommendations.

## Systematic Review

Webmaster to insert the Systematic Review citation and link to Pubmed using this format when it is available if published

Tiwari et al. Single or stacked shocks for pediatric defibrillation - (in preparation)

## PICOST

**The PICOST (Population, Intervention, Comparator, Outcome, Study Designs and Timeframe)**

**Population:** Infants and children (excluding newborn children) who are in ventricular fibrillation (VF) or pulseless ventricular tachycardia (pVT) during out-of-hospital or in-hospital cardiac arrest

**Intervention:** More than one (stacked) shock(s) for the initial or subsequent defibrillation attempt(s)

**Comparison:** A single shock for each defibrillation attempt

**Outcomes:** Any clinical outcome including but not limited to:

* Survival to hospital discharge with good neurologic outcome
* Survival to hospital discharge
* Survival to hospital admission
* Return of circulation (ROC)

The PLS TF prefers outcomes defined in the P-COSCA publication (1)

**Study Design:** Randomized controlled trials (RCTs) and non-randomized studies (non-randomized controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) that directly concern the population and intervention described above are eligible for inclusion. If it is anticipated that there will be insufficient studies from which to draw a conclusion, case series may be included in the initial search. The minimum number of cases for a case series to be included was set by the taskforce at 5. Unpublished studies (e.g., conference abstracts, trial protocols) are excluded. All relevant publications in any language are included as long as there is an English abstract.

**Timeframe:** All years. The last search was performed on 15 May 2024.

**PROSPERO Registration:** CRD42024559428

**Consensus on Science**

In this systemic review, we did not find any pediatric randomized controlled trials, non-randomized trials, observational studies or case series comparing single versus stacked shock in children with out-of-hospital or in-hospital cardiac arrest with VF or pVT.

**Treatment recommendations**

The Treatment Recommendation (TR) of 2005 is unsupported based on a rigorous systematic review. The lack of any available direct or indirect evidence, considered appropriate by the Pediatric Task Force for inference, suggests this TR should be withdrawn.

In infants and children with out-of-hospital or in-hospital cardiac arrest in VF or pVT, we suggest a single-shock strategy followed by immediate CPR (beginning with chest compressions) (Good Practice Statement).

**Justification and Evidence to Decision Framework Highlights**

The 3-shock (stacked) strategy followed in pediatric VF or pVT before the 2005 AHA guideline was based on an extrapolation of ACLS recommendations in adults. The 1-shock strategy has not been directly studied against a 3-shock strategy in pediatric VF/pVT but the 2005 recommendation (2) that ‘providers should give a single shock followed immediately by CPR (beginning with chest compressions) rather than the 3 successive (“stacked”) shocks in pediatric VF or pVT was based on the evidence that:

1. First-shock success rate of currently used biphasic defibrillators is up to 90%.
2. In a 3-shock sequence (stacked) the delay between delivery of the first shock and delivery of the first post-shock compression is reported to be up to 37 seconds.
3. Interruption of chest compressions reduces coronary perfusion pressure.
4. If the first shock fails, intervening chest compressions may improve oxygen and substrate delivery to the myocardium, making the subsequent shock more likely to result in defibrillation.
5. Data from animal studies documents harmful effects from interruptions to chest compressions.

EtD table NOT APPLICABLE AS NO CITATIONS IDENTIFIED

**Knowledge gaps**

## There are no randomized controlled trials directly comparing stacked with single biphasic shocks in pediatric defibrillation. With the advent of biphasic defibrillation, indirect evidence from impedance studies (3) has refuted the benefit of stacked shocks, a concept previously recommended for monophasic shocks. As a single shock strategy is now current practice, and that future studies on this topic is unlikely, the taskforce decide to discontinue examining this question in the future.

**References**

1. Topjian AA, Scholefield BR, Pinto NP, Fink EL, Buysse CMP, Haywood K, et al. P-COSCA (Pediatric Core Outcome Set for Cardiac Arrest) in Children: An Advisory Statement From the International Liaison Committee on Resuscitation. Resuscitation. 2021;162:351-64.

2. International Liaison Committee on R. 2005 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Part 3: defibrillation. Resuscitation. 2005;67(2-3):203-11.

3. Niles DE, Nishisaki A, Sutton RM, Brunner S, Stavland M, Mahadevaiah S, et al. Analysis of transthoracic impedance during real cardiac arrest defibrillation attempts in older children and adolescents: are stacked-shocks appropriate? Resuscitation. 2010;81(11):1540-3.