Systematic Review Snapshot

TAKE-HOME MESSAGE
Data are inadequate to determine whether recent devices (either load-distributing band or piston-driven) confer benefit or harm, though early trial data suggest they do not.

Do Mechanical Devices Improve Return of Spontaneous Circulation Over Manual Chest Compressions in Out-of-Hospital Cardiac Arrest?

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Results
An initial analysis combining both devices showed a significantly higher odds ratio of return of spontaneous circulation compared with that for manual compressions, though this was from an analysis pooling trial and observational data. Meta-analysis of a piston-driven device with active compression/decompression (PD) studies, 3 of them trials, demonstrated no benefit, whereas the only randomized trial for a load-distributing band (LDB) showed no return of spontaneous circulation benefit and was terminated early when preliminary results trended toward decreased survival.1 There was poor reporting of demographic and adverse outcome data in 10 of the 12 studies.

Commentary
Despite extensive research into pharmacologic therapy, targeted temperature management, and improvement in guidelines, out-of-hospital cardiac arrest continues to carry high rates of morbidity and mortality.2 Recent research and recommendations suggest that high-quality compressions with minimal interruptions are associated with improved survival.3 Mechanical compressive devices offer the theoretical benefits of improved quality and defibrillation while compressing, though a 2011 Cochrane meta-analysis found neither benefit nor harm with devices, according to 4 trials spanning 3 decades.4

In the current review, 12 studies with 4 trials (3 for PD and 1 for LDB) were analyzed. No benefit was observed for the PD device, and associations with improved outcome for LDB were observed only in observational data. The lone LDB trial by Hallstrom et al1 was terminated early for harm. Unfortunately, half of the studies in the review were unpublished (abstracts found only on

METHODS

DATA SOURCES
Searches were conducted in MEDLINE, the clinicaltrials.gov registry, and bibliographies on manufacturer Web sites for studies written in English.

STUDY SELECTION
Studies comparing either of the 2 commercially available devices with manual compressions were selected, with the primary endpoint of being the ability to achieve return of spontaneous circulation. Return of spontaneous circulation was defined as any palpable pulse with measurable blood pressures for at least 1 minute.
Studies must have been human controlled (randomized, phased, historical, or case-control) investigations with confirmed out-of-hospital cardiac arrest cases. Studies including cardiac arrests caused by trauma and preclinical animal/manikin studies were excluded.

DATA EXTRACTION AND SYNTHESIS
Random-effects models were used to assess the relative effect of treatments on return of spontaneous circulation. Variation in outcome by study was assessed with Cochran’s Q statistic. Forest plots, with 95% confidence intervals, were used to assess the overall meta-analytic and
manufacturers’ Web sites), the authors made uncommon and potentially misleading use of meta-regression to test device effects, and observational data were pooled with trial data.

Large trials could shed light, though a recent effort again showed no benefit with a PD device. The Circulation Improving Resuscitation Care multicenter trial, completed in November 2013, may provide more data.


Michael Brown, MD, MSc, Alan Jones, MD, and David Newman, MD, serve as editors of the SRS series.