

Data tables

Author/year	Study Timeframe	Design	Country	Population	Intervention Category	Intervention description	Comparator	Outcome measured	Main findings for CPR quality	Main findings for Patient Outcomes
Abella 2007	Dec 2002 – Dec 2005	Pre/post interventional study	USA	Consecutive adult IHCA (n=156)	Audio & visual	Investigational monitor/ Defibrillator with CPR-sensing and AV feedback capability	Real-time feedback disabled.	CC rate & depth, NFF, ventilation rate	CC rate: no sig diff CC depth: no sig diff Vent rate: no sig diff NFF: no sig diff Difference of variance p-values 0.003, 0.20, 0.04, <0.001, respectively (less results at high or low extremes in the feedback group).	ROSC: no sig diff Survival: no sig diff
Alqudah 2022	Controls: Jan 2015 to Jan 2019. Cases: Feb 2019 to Jan 2020	Pre/post interventional study	Australia	EMS-witnessed adult OHCA: Control (n=1,561); Cases (n=420)	other	HP CPR protocol including RTAVFB	Before HP-CPR protocol implementation	Survival to hospital discharge, survival to hospital, ROSC	Not reported	ROSC: no sig diff Survival to hospital: no sig diff Overall survival: AOR 1.37 (95% CI: 1.00–1.88) Initial shockable AOR 1.70 (95% CI:1.03–2.82).
Beaulac 2023		Commentary	Canada and USA	Cardiac arrest patients, no specific cohort	other	A limited commentary on TEE as a source of CPR feedback	None	Potential use of TEE for CPR feedback provision	Demonstrates how TEE might provide feedback rather than commenting on quality	Potential of TEE discussed as secondary finding from other studies
Berg 1994	Aug 1990 to Aug 1992	Prospective observational study	USA	Paediatric OHCA (all causes) (n=6)	Audio only	Pre-recorded audio tape instructing resuscitator to perform chest compressions at the designated rate.	None	End-tidal CO ₂ partial pressure.	PETCO ₂ at 140/min higher than at baseline (12+/-7 torr vs. 4+/-3 torr, p<0.05). No sig impact on PETCO ₂ at 100/min	none reported

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Bobrow 2013	Pre: Oct 2008 - Mar 2010. Intervention: May 2010 - Sept 2011.	Pre/post interventional study	USA	Consecutive adult OHCA, presumed cardiac cause (n=484)	Audio & visual	E-series; ZOLL Medical, Chelmsford, MA. When compressions discontinued for 3s+, an idle timer is prominently displayed. An audio Metronome set to 100 compressions per minute, sounds any time compressions are performed.	Real-time feedback disabled.	Survival to discharge; favorable functional outcome; CCF; CC depth; CC rate; release velocity; pre/post shock pause; vent rate	Mean CC depth: increased Mean CC rate: decreased Mean recoil: increased Preshock pauses: Vent rate: decreased ETCO2 mmHg: increased	Survival to discharge All patients: sig increase Witnessed: sig increase Shockable: sig increase Use of TH - sig increase MICR protocol compliance: sig increase Favorable CPC: All patients: sig increase Witnessed: sig increase Shockable: sig increase Use of TH: sig increase MICR protocol compliance: not sig
Bohn 2011	Apr 2007 to Apr 2009	RCT	Germany	Consecutive adult OHCA (n=312)	Audio feedback plus post-event visual feedback & debriefing	(AED Pro with CPR-D Padz, ZOLL Medical Corporation, Chelmsford, MA, USA) Audio prompts + metronome and visual FB after training (Extended feedback)	Metronome and visual fb after training (Limited feedback)	ROSC to ED and CPR quality	Almost identical CPR quality in both arms	No difference in ROSC to ED for both arms
Bolstridge 2016	Feb 2015 to Feb 2016	Pre/post interventional study	not specified	pulseless, most likely IHCA: pre (n=34); post (16 patients)	Audio only	Audible metronome	No metronome	Survival to hospital discharge; ROSC; CPR within target range	Metronome improved % compressions within target rate (31.3% to 56.4% p=0.0015) and depth (27.2% to 48.2% p=0.0078)	No sig change in ROSC (53.3% to 77.8% p=0.073); no sig change in survival to discharge (17.6% to 37.5% p=0.13)

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Chandra 2011	Phase 1: Sept 2008 - Sept 2009 Phase 2: Oct 2009 - Jun 2010	Prospective observational study	USA	EMS-treated adult OHCA, cardiac aetiology	Feedback plus debriefing	Initiation of real-time automated and delayed summative feedback – not stated if audio, visual or AV	no feedback	Survival to hospital discharge and CPR quality	Phase II: CC depth: sig increase CC fraction: sig increase Greater number of compressions per minute Fewer seconds without CC: no sig diff	ROSC: no sig diff Neurologically intact survival: no sig diff
Chiang 2005	Sep 2003 to Mar 2004	Pre/post interventional study	Taiwan	Video recorded adult OHCA, non-traumatic cause: pre n=17; post n=13	Audio only	Metronome and siren once every 20s	No metronome	Hands off period; proportion of ETI attempts <20s; ROSC; survival to one week	Hands-off period/min during CPR: intervention group = 12.7 ± 5.3s vs observation group = 16.9 ± 7.9s vs, p < 0.05. Total hands-off time during CPR (164 ± 94s versus 273 ± 153 s, p < 0.05 Proportion of ETI attempts <20s = 56.3% vs 10%, P < 0.05	ROSC: No sig change 7-day survival: No sig change
Cho 2009	Case series	Others	Korea	2 patients, deceased	Audio and visual	Defib with AV feedback device (HeartStart MRx Q-CPR)	none	Visible damage to chest wall	none	None
Couper 2015	Nov 2009 and May 2013	Prospective observational study	UK	Adult IHCA treated by hospital emergency teams (n=1395)	Audio & visual feedback (Phillips MRX QCPR) plus pre-event education & post event debriefing	Phase 2: Hospital 1 - Real-time AV feedback Hospital 2 - Real-time AV feedback + post-event debriefing.	Phase 2: No intervention at Hospital 3 during	ROSC; Survival to discharge; CC depth	No sig diff between hospitals but evidence of a system-wide improvement in phase 2, leading to improvements in process-focused outcomes.	No sig diff between hospitals but evidence of a system-wide improvement in phase 2, leading to improvements in ROSC

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Couper 2020	Jan 2016 - Dec 2017	Survey	UK	12,852 adult (16 +) IHCA at hospitals responding to a survey	Audio & visual feedback plus post event debriefing	Impact of system quality indicators, including real-time AV feedback	None	Survival to discharge; ROSC; CPC	none	3-fold difference in risk adjusted survival between lowest and highest performing trusts. OR of survival for real-time AV feedback 0.14. Posterior median 0.87 95%CI (0.68-1.12).
Crowe 2015	Nov 2010 to Nov 2013	Pre/post interventional study	USA	166 adult (OHCA & IHCA); non-trauma	Audio & visual feedback (R-series; ZOLL) plus post event debriefing	Scenario-based training, RTAVF + post-event debriefing in ED.	Pre-intervention period	CPR quality	Mean CC depth, % CCs ≥ 51 mm, mean CCRV all improved post-intervention. No change in CC fraction %, mean CC rate or pre-shock pause median	6 survivors overall, too few patients to assess survival impact.
Davis 2015	Jul 2005 to Jun 2012	Pre/post interventional study	USA	Adult IHCA without DNR pre=182; post=374	Audio and visual	Performance improvement programme which included availability of RTAVFB	Pre-intervention period	CPR quality, IHCA incidence and survival to discharge	Quality of CPR 'excellent' in post-intervention period but not measured in pre-intervention period.	AOR for survival to discharge 2.2 (95%CI 1.4-3.4) and good neuro outcome 3.0 (95%CI 1.7-5.3)
Fletcher 2008	2003 to Dec 2006	Retrospective observational study	UK	OHCA, number of patients not stated	Audio only	Musicians' metronomes attached to defibrillators	Pre-intervention period	CPR quality and survival to discharge	With the introduction of metronomes, median compression rate fell to 'near ideal' rates.	In 2003 (pre), 2/202 patients discharge alive; 2004 7/196; 2005 17/139. Described as statistically sig improvement
Freese 2014	Pre: Aug 2010 to Jul 2011 Post: Aug 2011 to Jul 2012	Pre/post interventional study	USA	Bystander witnessed OHCA cardiac aetiology (n=1598)	Audio & visual	Addition of defibs with real-time AV feedback to standard care (no further details provided)	Standard care	ROSC; sustained ROSC; survival to adm, survival to discharge	Not reported	ROSC: sig increase Sustained ROSC: sig increase Survival to hosp adm: not sig Survival to discharge: not sig

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Fried 2011	May 2007 to Feb 2009	Retrospective observational study	USA	IHCA and ED (n=108)	Corrective feedback (e.g. verbal instructions)	Defibrillation with real-time AV feedback	None	Instances of corrective feedback in each \geq 120 sec block	Some degree of leaning 91% of cases. Leaning reduced to some extent after verbal feedback. Reduction in leaning percentage after feedback prompting was statistically significant.	NA
Goharani 2019	Jan 2015, to Sept 2015	RCT	Iran	Adults admitted to the ICU from ED (n=1454).	Audio & visual	Cardio First Angel. Handheld device. Appln of 400 ± 30 N of force results in an audible click alerting the rescuer to cease compression, and additional click on decompression alerts rescuer to resume compression	manual CPR without device	Sustained ROSC (> 30 min); Survival to ICU; Hospital discharge	Not reported	Sustained ROSC: sig increase Survival to ICU discharge: sig increase Survival to hospital discharge: sig increase.
Hopkins 2016	Jul 2008 to Oct 2011	Pre-post interventional study	USA	OHCAs (n=739)	Other	CPR feedback (Zoll E Series Defibrillators; Zoll Corp) & system improvement	Prior to protocol implementation	Cerebral Performance Category (CPC)	not reported	Neurologically intact survival: sig improvement.
Hostler 2011	Feb 2007 to Mar 2009	RCT	USA and Canada	Adult (20+) OHCA (n=1586)	Audio & visual	QCPR	Feedback turned off	ROSC before hospital admission; Survival to hospital discharge; CPC at discharge.	Increased % time in which CC were provided Increased CC depth Decreased % CCs with incomplete release	ROSC before hospital adm: no diff Survival to discharge: no diff Awake at hospital discharge: no diff

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Kennedy 2023	Jan 2013 to Dec2019	Retrospective observational study	USA	Adult OHCA, non-traumatic (n=2132)	Audio	Metronome	Without a metronome	the median compression rates for all periods with metronome	Median compression rate: No metronome = 112.8 (IQR 108.4-119.1) vs. with metronome = 110.5 (IQR 110.0-112.0). Compression rate 109-111: No metronome = 18% vs with metronome = 62%. Compression rate above 120 CPM: No metronome = 21.8% vs. with metronome = 3%. Compression rate below 100 CPM: No metronome = 5.4% vs. with metronome = 0.7%	not reported
Kern 1992	Not reported	Others	Not reported	Adult OHCA, non-traumatic (n=23)	Audio	With rhythmic audiotones for rate direction	without rate direction	ETCO2 level	Mean ETCO2 level: with audiotones to guide the rate of chest compressions = 14.0 +/- 1.3 mm Hg after the first 60 seconds of audible tones directing compressions vs. 8.7 +/- 1.2 mm Hg during standard CPR	not reported
Khorasani-Zadeh 2020	Jan 2017 to Dec 2018	Retrospective observational study	USA	Adult IHCA	Audio	Metronome	No metronome	mean CC rate; mean CC depth; % CC 2.0 to 2.4 in); % CC 100 to 120/min.	Mean CC rate 100-120/minute: with metronome = 71.14% vs no metronome = 28.16% p<0.001). Mean CC depth 2.0-2.4in: With metronome = 34.84% vs no metronome = 29.35% p<0.03. Mean % release velocity 400 mm/s: no sig diff	not reported

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Kirkbright 2014	1946 to May 2013	Systematic review (with meta-analysis)		Health care providers of CPR. Subjects included humans in cardiac arrest and manikins in any setting	Audio and visual	Real-time use of CPR feedback device	CPR performed without the use of a feedback device	Patient survival to hospital discharge with good neurological outcome; ROSC, alive at ED; CC rate, depth, no-flow fraction	Mean CC depth increased by 2.5mm (95% CI 0.9-4.3); mean CC rate increased by 6/min (95% CI 2.4-10.7); no-flow fraction decreased by 1.9% (95% CI 1.8-2.0) (3 human studies)	Neuro outcome: no sig diff (1 study); ROSC and survival to d/c: no sig diff (3 studies).
Ko 2020	1966 to 2020	Systematic review (without meta-analysis)		Patients with cardiac arrest in any setting	Other	System-level performance improvement.	Pre-intervention	Favourable CPC at discharge, survival to hosp adm or discharge	Skill performance in actual resuscitations. 12/14 studies showed improvement in skills performance.	Favorable CPC @ discharge: sig higher 13/19 studies; 6/19 (1 RCT): no sig improvement. Survival to hospital discharge: sig higher 14/22 studies; 8/22 (+1 cluster RCT): no sig improvement.
Koch 2022	Oct 2018 to Nov 2019	Prospective observational study	Austria	Patients admitted to ED with mechanical CPR, ECPR	Visual	Carotid Artery Ultrasound	no	ROSC; survival to discharge	No sig diffs in peak systolic velocity or end diastolic velocity (EDV) between CPR, ECPR and ROSC cases.	ROSC - 44%, and survival to hospital discharge - 19%.
Kramer-Johansen 2006	Pre: Mar 2002 to Oct 2003 Intervention: Oct 2003 to Sept 2004.	Pre/post interventional study	Norway	Adult OHCAs (n=284)	Audio & visual	Prototype defibrillators based on standard Heartstart 4000	no feedback	Change in quality variables after intro feedback.	CC depth: sig increase Median % CC with adequate depth: sig increase Mean CC rate: sig decrease Vent rate: no sig diff Fraction of time without CC: no sig diff	discharge alive: no sig diff In log reg, witnessed arrest & average compression depth were sig associated with rate of hosp adm.

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Lakomek 2020	Group 1: Jan to Jun 2016 Group 2: Jun 2016 to Apr 2017 Group 3: Apr 2017 to Mar 2018	Prospective observational study	Germany	Adult OHCA	Audio & visual	CorPatch1- AV prompts.	no sensor and sensor only CPR	CCF; average CC frequency; CC depth; CC pauses; pre-shock pauses; any ROSC; ROSC at hospital admission	CCF: Sensor-only vs no sensor – sig diff. No further diff after activation of sensor-feedback CPR (group 3) CC freq: declined over the 3 study groups, reaching guideline recs after activation of sensor-feedback CPR (group 3). Mean CC depth: no sig diff with sensor-only but % CCs increased significantly with sensor-feedback CPR (Group 3)	ROSC at hospital: no sig diff ROSC; No sig diff
Leis 2013	Nov 2007 to Dec 2010	Prospective observational study	Spain	OHCA attended by the Madrid Emergency and Rescue Service (SAMUR)	Audio & visual	Use of a CPR measurement and feedback device (the Q-CPR)	Patients where no device was used	ROSC, CC per min; CC depth; % of adequate CC depth	Mean (SD) compressions per minute 105.7 (7.9); mean depth 41 (4.76) mm; % adequate depth = 76.5% (17.6%). Complete chest recoil did not occur in 223 (13.26%) compressions per event	ROSC: no sig diff
Lukas 2012	Jan 2007 to Mar 2011	Retrospective observational study	Germany	Adult OHCA, non-traumatic	Other	Quality management approach i.e. training, real-time feedback, and debriefing	Matched pairs, comparison with area that used CPR without QM	ROSC; Hospital admission	CPR quality measured only in the intervention group CC depth (4.8 ± 0.91); Rate 103.5 ± 5.94	No sig diffs
Lv 2022	To June 2020	Systematic review (with meta-analysis)		Patients in cardiac arrest, no exclusion criteria stated	Other	Studies using real-time CPR feedback	No Real-time audio feedback	ROSC; Survival to discharge; Good neuro outcome	Not reported	No sig diffs

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Lyngby 2021	Lyngby	Systematic review (with meta-analysis)		Adult OHCA	RT feedback and/or post event feedback	Real-time feedback and/or post event feedback	No Real-time feedback and/or post event feedback	CCD, CCR, recoil, CCF and vents. ROSC, 30d survival & survival to discharge.	Real-time feedback significantly improves CCD and CC rate. RT and post event feedback need to be combined to improve overall quality	No sig diffs, but substantial heterogeneity in studies.
Lyngby 2022	Oct 2018 to Feb 2020	Prospective observational study	Denmark	OHCA, non-traumatic (n=1545)	feedback plus post event debriefing	Real-time CPR feedback (Zoll X Series) in an area with high OHCA survival, as well as the effect of adding post-event clinical debriefings.	no feedback	chest compression depth (CCD), rate (CCR), and fraction (CCF)	Guideline compliant CCD 21.8% (no feedback) vs 30.9% (real-time feedback) vs 33.0% (real-time + post-event feedback). CCR - 60.2%/ 74.6%/ 75.1% resp. Combination of guideline compliant CCD and CCR simultaneously - 13.6%/ 23.3%/ 25.8% resp. CCF - 76.8%/ 80.9%/ 81.3%	not reported
Miller 2020	Not stated	Systematic review (with meta-analysis)		Adult IHCA	audio & visual	Free-standing non-AED audio-visual feedback device (Ambu CardioPump & Cardio First Angel)	standard manual chest compressions	Sustained ROSC (>30 min); Survival to ICU discharge; Survival to hospital discharge; Adverse events	not reported	Sustained ROSC: 4 studies: sig diff with AVF use Survival to hosp discharge: 2 studies (n = 922): sig diff with AVF use 3 studies (n=984) sig diff with AVF use. One study reported survival ≥ 24 h and found improvement with AVF device use.

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Nehme 2021	Jan 2015 to Jan 2020	Pre/post interventional study	Australia	OHCA, excluded EMS witnessed (n=10,600)	High-performance CPR including RTAVFB	RTAVF as part of overall system improvement	prior to protocol	Survival to hospital discharge; event survival; ROSC; CPR quality	CPR quality (median, IQR) control vs intervention: CCF 84 (77,88) vs 92(90,94) p<0.001 Pre-shock pause 13 (12,19) vs 5*2.8) p<0.001 Post-shock pause N/A vs 3(3,4) CC depth 5(4,6) vs 6(5,6) p<0.001 CC rate 118 (109,125) vs 118 (113,122) p=0.8 CC release vel. N/A vs 378(432,422)	Survival to hospital discharge (AOR 1.50; 95% CI: 1.10, 2.04; p = 0.01), Event survival (AOR 1.34; 95% CI: 1.09, 1.65; p = 0.006) ROSC (AOR 1.38; 95% CI: 1.14, 1.65; p = 0.001). After removing non-sig temporal trend, 33% increase (AOR 1.33; 95% CI: 1.11, 1.58; p = 0.002) in the odds of survival over the 12-month intervention period. Average marginal effect of intervention = 8.7 (95% CI: 3.2, 14.1) additional survivors per million population.
Ng 2021	7 papers between 2008 and 2021	Systematic review (with meta-analysis)		Health care professionals, OHCA	High-performance CPR (unclear if each intervention inc. feedback)	High-performance CPR (HP CPR), multi-tiered response (MTR) and minimally interrupted cardiac resuscitation (MICR)	no intervention	ROSC; Survival to discharge; , neurological outcome	Not reported	Sig improved likelihood of prehospital ROSC (pooled odds ratio (OR) = 1.46, 95% CI: 1.16 to 1.82, p < 0.001), survival to discharge (pooled OR = 1.32, 95% CI: 1.16 to 1.50, p < 0.001) and favourable neurological outcomes (pooled OR = 1.24, 95% CI: 1.11 to 1.39, p < 0.001) with HP CPR or similar interventions.

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Niles 2009	Oct 2006 to Feb 2008	Prospective observational study	USA	Pediatric IHCA (≥8 yo) (n=20)	Audio & visual	Heartstart	no audio-visual feedback	leaning force	Leaning force was greater with no FB Leaning > 2.5 kg (adult feedback threshold) was greater with no FB CC without leaning, defined as a leaning force of < 0.5 kg, was greater with no FB	not reported
Olasveengen 2007	Oct 2004 to Jun 2005	Prospective observational study	Norway, UK, Sweden	Adult OHCA (n=124)	Feedback plus post event debriefing	CPR performance based evaluation	Before CPR-PE	CC depth, rate, no flow time, ventilation rate	No sig diffs	No sig diffs
Park 2018	Jan 2013 to Dec 2016	Pre/post interventional study	Korea	Adult (15+) OHCA, presumed cardiac aetiology (n=12,670)	other	A bundle of three Utstein CPR programs and feedback CPR program using defibrillators with feedback functions.	before bundle implementation	Prehospital ROSC Survival to discharge Good CPC	not reported	After implementation of bundled intervention (DACPR + MTR + feedback CPR): Good neurological recovery and survival to discharge were significantly increased.
Pearson 2015	Jan 2010 to Jun 2014	Retrospective observational study	USA	OHCA, non-traumatic (n=11,232)	Real-time audio-visual feedback	RTAVFB as part of team-focused CPR (TFCPR)	standard CPR	Survival with good neuro outcome; survival to hospital adm; survival to hospital discharge	n/a	Good neuro outcome higher with TFCPR [836 (8.3%, 95%CI 7.7–8.8%)] vs. standard CPR [193 (4.8%, 95%CI 4.2–5.5%)]. Log reg controlling for demographic and arrest characteristics: TFCPR (OR 1.5), witnessed arrest (OR 4.3), initial shockable rhythm (OR 7.1), and in-hospital hypothermia (OR 3.3) assoc with good neuro outcome. Use of AV feedback was negatively associated

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Pfeiffer 2018	Not clear	Retrospective observational study	USA and Canada	Paediatric IHCA Data (pediRES-Q); 105 events from 10 centres; 6 with CPR coach (60 events), 4 no coach (45 events).	Corrective verbal feedback instructions from CPR coach	CPR coach – dedicated team member, providing RTFB. (C) RTAVFB also available	No CPR coach (NC) RTAVFB also available	CC depth, rate, CCF. ROSC	Greater % CPR time within AHA targets for CC rate [C: 59% (SD28%) vs NC: 41% (SD 27%), P=0.001]. CC depth [C: 42% (SD38%) vs NC: 19% (SD 27%), P=0.001]. No sig diff in mean CC fraction	Sig higher ROSC rate for those centres that routinely use CPR coaches.
Picard 2022	Aug 2019 to Dec 2020	Retrospective observational study	Canada	CPR at ED, (unclear OHCA vs IHCA, probably adult)	Other	Analysis of QI data at a single centre.	no feedback device use	Time & duration resus; no. CCs; NFF; mean CC depth & rate; peak force; pause time; % CCs at target depth & recoil	Those using visual feedback had 33% more CC at target rate.	Not reported
Rainey 2021	Not stated	Pre/post interventional study	USA	OHCA and IHCA in ED (n=24 pre and n=44 post)	Metronome	Audio feedback by metronome	No metronome	CC Rate	CC rate: pre ranging from 89 to 201, with 34% (n=95) CC delivered w/l recommendation, post: ranging from 86-135, with 79% (n=372) w/l compliance	Not reported
Riyapan 2019	May to Sep 2017	Pre/post interventional study	Thailand	Adult OHCA in ED (n=32)	Audio & visual	Real-time audio-visual feedback (RTAVF) during resuscitation (defibrillator with CPR pad from Zoll R-series®)	No RTAVF	CC depth & rate; ROSC; survival to discharge & 30d; CPC	CC depth: sig increase CC rate: sig decrease Perishock pause: no sig diff	No sig diffs.

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Sainio 2013 (a)	Case series	Others	Finland	2-year-old boy found in cardiac arrest secondary to drowning with hypothermia	Audio & visual	RTAVF during resuscitation (HeartStart MRx defibrillator with Q-CPR™)	No RTAVF	CPR quality and physiologic data through invasive arterial pressure monitoring.	Improved hemodynamic parameters with classic one-handed technique with RTAVF compared to either the two-thumbs encircling hands or two-thumbs direct sternal compression techniques.	Achieved ROSC but did not survive to hospital discharge.
Sainio 2013 (b)	Nov 2008 to Apr 2010	Retrospective observational study	Finland	OHCA treated by HEMS (n=187)	Audio & visual	RTAVF (HeartStart MRx defibrillator with Q-CPR™)	No RTAVF	Any ROSC; Survival to ED/ICU, Alive after 24 hours, Survival to hosp discharge; good neuro outcome at 6 month	CPR quality was not compared between groups.	Any ROSC: sig increase Other outcomes: no sig diffs.
Saulle 2023	Jul 2021 to Aug 2022	Retrospective observational study	USA	OHCA during single-rescuer sequences of CPR delivery, non-traumatic (n=47)	Defibrillator visual feedback	audiovisual feedback	none	CC rate, depth, pauses, ROSC	Mean CC rate: 114 ± 12 CC/min; mean depth: 55.8 ± 18.5mm. CC rate <100 CC/min: 4%; >120 CC/min: 34%; Depth <50 mm: 35%; >61 mm): 42%.	52% of the cohort achieved ROSC.
Schultz 2015	Not stated	Systematic review (without meta-analysis)		OHCA & IHCA	Quality measurement intervention (details not provided)	Not clear	Not clear	survival to hospital discharge	n/a	Heterogeneity prevented calculating a pooled effect
Setälä 2015	Unknown	Prospective observational study	Finland	OHCA treated by HEMS (n=10)	Audio & visual	RTAVF ((Ambu CardioPump)	Manual active compression decompression (ACD) devices	EtCO2 and CPR quality parameters	Manual ACD-CPR is not superior to quality-controlled CPR provided using a real-time audio-visual feedback system defibrillator	Not reported

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Sutton 2014	Nov 2011 to May 2103	Prospective observational study	USA	IHCA PICU (aged 1 to 8)	Audio & Visual	RTAVF during resuscitation (HeartStart MRx defibrillator with Q-CPR™)	No RTAVF	CC interruption cause, depth, rate, depth compliance, rate compliance, significant leaning force	Median % epochs per event achieving targets increased with RTAVF for rate [88(IQR:79,94) vs.39(IQR18,62); p = 0.043] & excellent CPR [28 (IQR:7.2,52) vs. 0(IQR:0,1)%; p = 0.018].	No sig diff
Targett 2014	21 papers between 1994-2013	Systematic review (without meta-analysis)	Multiple countries	including CA and sim study	Audio	metronome use	some studies without comparison	CC rate	no pooled data available	not reported
Vahedian-Azimi 2016	Jun to Oct 2014	RCT	Iran	IHCA in the mixed medical-surgical ICUs of four academic teaching hospitals (n=229)	audio & visual	RTAVF during resuscitation (Cardio First Angel)	No Real-time audio feedback during resuscitation	Guideline adherence; CPR qual; ROSC rates; CPR-associated morbidity.	CPR quality; sig improvement in the intervention group CPR evaluation score was 9 (9-9.75) on a 10-point scale in the intervention group, compared with 6 (5-6) in the control group.	ROSC observed more frequently in the intervention group. Rib Fractures: sig decrease in intervention group Sternum fractures: no sig diff
Vahedian-Azimi 2020	Dec 2013 to Mar 2014	Pilot RCT	Iran	IHCA in the mixed medical-surgical ICUs of four academic teaching hospitals (n=22)	Audio & visual	RTAVF during resuscitation (Cardio First Angel)	No RTAVF	Sustained ROSC. CPR effectiveness and guideline adherence	CPR evaluation score was 8.54 (±0.8) in the intervention group on a 10-point scale, compared with 5.63(±0.5) in the control group.	No sig diff

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Wang 2020	Inception to Apr 2020	Systematic review (with meta-analysis)		Adult patients with OHCA or IHCA	Audio & visual	RTAVF during resuscitation	No RTAVF	ROSC; short-term survival and favorable neurological outcome at discharge.	not reported	Only the studies using Cardio First Angel demonstrated significant differences. Heterogeneity test (p=0.24)
Yeung 2009	Inception to Dec 2008	Systematic review (without meta-analysis)		CPR on children and adults	Audio & visual	RTAVF during resuscitation	No RTAVF	CC rates; ETCO ₂ ; duration of intubation attempts; ventilation rates; mean values of CPR variables; ROSC; survival to hosp discharge; discharge	2 non-randomised cross-over studies show that metronomes improve CC rate and ETCO ₂ . 4 before/after studies evaluating the introduction of CPR feedback/prompt devices in clinical practice showed improved CPR performance.	CPR education programme (included the use of metronomes) found improvements in CPR and was associated with improved survival rates but no significant improvement in survival to hospital discharge.