Study	Pub Year	Location	Category	Study Design	Sample	Primary Outcome	Main Findings
Tsunoyama 2017	2017	Japan	Advanced Dispatcher Training	Before/After	532	Bystander CPR Initiation	After the program, provision of oral guidance to callers slightly increased from 63% of cases to 69% (P = 0.13) and implementation of chest compression on patients by bystanders significantly increased from 40% to 52% (P = 0.01). Appropriate chest compression also increased from 34% to 47% (P = 0.01). In analysis stratified by the provision of oral guidance, increased chest
Park 2022	2022	Korea	Advanced Dispatcher Training	Before/after registry study	10127	Survival to hospital discharge	OHCA patients in the intervention group were less likely to receive bystander cardiopulmonary resuscitation (57.8% vs 61.1%; P = .02) and showed lower survival outcomes (5.7% vs 6.4% for survival up to hospital discharge; P = .34 and 2.8% vs 3.7% for good neurological recovery; P = .11), but this was not statistically significant. Compared to 2014, good neurological recovery in 2017 was significantly improved in the intervention group (Difference-in-difference (DID) for good neurological recovery = 3.2%; 0.6–5.8). There were no statistically significant differences in return of spontaneous circulation and survival up to hospital discharge between the 2 groups (DID for survival to discharge was 1.8% [?1.7 to 5.3] and DID for return of spontaneous circulation was ?2.5% [?9.8 to 4.8]).
Harjanto 2016	2016	Singapore	Advanced Dispatcher Training	Before/After; intervention	2968	Survival to hosptial admission, survival neurologically intact at 30 days	Bystander CPR rates increased from 22.4% to 42.1% (p < 0.001) with odds ratio of 2.52 (95% confidence interval [CI]: 2.09–3.04) and ROSC increased significantly from 26.5% to 31.2% (p = 0.02) with OR of 1.26 (95%CI: 1.04–1.53) after the comprehensive DACPR training program intervention. Significantly higher survival at 30 days was observed for patients who received bystander CPR from a trained person as compared to no BCPR (p = 0.001, OR = 2.07 [95%CI:
Choa 2008	2008	Korea	Animation vs. human Dispatcher	Randomized Mannikin Simulation	85	CPR Performanc e Checklist	The AA-CPR group had a significantly better checklist score (p < 0.001) and time to completion of 1 CPR cycle (p < 0.001) than the DA-CPR group. In an objective assessment of psychomotor skill, the AA-CPR group demonstrated more accurate hand positioning (68.8±3.6%, p = 0.033) and compression rate (72.4±3.7%, p = 0.015) than DA-CPR group. However, the accuracy of compression depth (p = 0.400), ventilation volume (p = 0.977) and flow rate (p = 0.627) were below 30%
Lerner 2019	2019	USA	Centralized Dispatch	Before/After	169	Not defined	Centralizing dispatcher CPR program to serve seven public safety answering points also increased bystander CPR (53%) over previously documented bystander CPR rate (20% the prior year).
Ro 2018	2018	Korea	Centralized Dispatch	Before/After; natural experiment	11616	Bystander CPR Initiation	OHCAs that occurred after the centralization period were more likely to receive BCPR (62.6%, 50.6% BCPR-with-DA and 12.0% BCPR-without-DA) than were those that occurred before-centralization period (44.6%, 16.6% BCPR-with-DA and 28.1% BCPR-without-DA) (p < 0.01, adjusted OR: 1.59 (1.38–1.83), adjusted
Lee 2014	2014	Korea	Metronome rates	Randomized Mannikin Simulation	78	Compression depth & rate	No significant differences among three different metronome rates (at least 100/min: the metronome rates were 120/min, 110/min, and 100/min in groups 1, 2, and 3, respectively). In all groups, the mean depth of chest compression was less than 5 cm. The mean rates of chest compression were 113.44 ± 12.35/min in group 1, 109.37±2.73/min ingroup 2, and 128.11±16.22/min in group 3. There was a significant difference among groups (P < .001). The mean rate of chest compression of group 1 (120/min) and group 3 (100/min) was higher than that of group 2 (110/min). However, the proportions of compressions between 100 and 120/min were 100.00% (24/24) in group 2, 70.00% (19/24) in group 1, and 25.93% (7/27) in group 3

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Park 2013	2013	Korea	Metronome sound	Randomized Mannikin Simulation	64	Compression depth & rate	The metronome group showed a faster compression rate than the control group (111.9 vs 96.7/min; p=0.018). A significantly higher proportion of subjects in the MG performed the DA-CPR with an accurate chest compression rate (100–120/min) compared with the subjects in the CG (32/33 (97.0%) vs 5/34 (14.7%); p<0.0001). The mean compression depth was not different between groups (45.9 vs 46.8 mm; p=0.692). However, a higher proportion of subjects in the MG performed shallow compressions (compression depth <38 mm)
Rasmussen 2017	2017	Belgium	Novel Protocol	Randomized Mannikin Simulation	125	Composite score*	The novel protocol (n = 61) improved CPR quality score (a composite endpoint of time to first compression, hand position, compression depth and rate and hands-off time; maximum score of 22 points) compared with the standard protocol (n = 64) (mean (SD): 18.6 (1.4)) points vs. 17.5 (1.7) points, p < 0.001. The novel protocol resulted in deeper chest compressions (mean (SD): 58 (12) mm vs. 52 (13) mm, p = 0.02) and improved rate of correct hand position (61% vs. 36%, p = 0.01) compared with the standard protocol. In both protocols hands-off time
Plodr 2016	2016	Czech	Novel Protocol	Before/After	326	Not defined; "Time from call to..." measurements**	Median times to cardiac arrest recognition were 46 s before the new protocol (PER 1) and 37 s after the new protocol (PER2) (p = 0.002), to first compression 2 min 35 s in PER1 and 2 min 25 s in PER2 (p = 0.549). Admission to hospital with return of spontaneous circulation (ROSC) was achieved in 39 patients (31.9%) in PER1 and 57 (45.6%) in PER2 (p < 0.05), discharge from hospital (CPC 1–2) in 9.0% and 14.4% patients in PER1 and PER2, respectively. If ventricular fibrillation was the initial rhythm, survival rate (CPC 1–2) was not statistically
Stipulante 2014	2014	Denmark	Novel Protocol (ALERT)	Before/After	223	Time from call to first compression	Before and after the ALERT protocol implementation (2009 and 2011). In 2009, only 9.9% victims benefited from bystander CPR, this increased to 22.5% in 2011 (p < 0.0002). The main reasons for protocol underutilization were: assistance not offered by the dispatcher (42.3%) and caller physically remote from the victim (20.6%). Median time from call to first compression, defined as no flow time, was 253 s in 2009 and 168 s in 2011 (NS). Ten victims were admitted to hospital after ROSC in 2009 and 13 in 2011 (p = 0.09) which was not statistically significant.
Birkun 2018	2018	Russia	Pre-recorded vs Live	Randomized Mannikin Simulation (Med students)	109	Overall CPR Performance Score	No significant differences between the recording-assisted and dispatcher-assisted groups based on the overall performance score (5.6±2.2 vs. 5.1±1.9, P>0.05) or individual criteria of the CPR performance checklist. The recording-assisted group demonstrated significantly shorter time interval from call receipt to the first compression (86.0±14.3 vs. 91.2±14.2s, P<0.05), higher compression rate (94.9±26.4 vs. 89.1±32.8 min-1) and number of compressions provided
Hallstrom 2000	2000	USA	Standard vs CCO CPR	Randomized prospective study	241	Survival to hospital discharge	A strategy of dispatcher-instructed chest compression plus mouth-to-mouth ventilation was no better than a strategy of dispatcher instructed chest compression alone in Seattle, USA where there is a two-tier system with relatively short response times and a tightly structured dispatch protocol. Of 241 patients randomized to chest compression instructions only, 35 survived (14.6%)

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Spelten 2016	2016	Germany	Standard vs CCO CPR	Randomized Mannikin Simulation	60	Not defined; "time to" and compression quality	Initial NFT was lowest in the DACO-CPR group (mean 21.314.4%), followed by dispatcher-assisted full CPR (mean 49.18.5%) and by unassisted CPR (mean 55.012.9%). Initial NFT covering the time of instruction was lower in DACO-CPR (12.15.4%) as compared to dispatcher-assisted full CPR (20.78.1%). Compression depth was similar in all three groups: 40.613.0mm (unassisted CPR), 41.012.2mm (DACO-CPR) and 38.815.8mm (dispatcher-assisted full CPR). Average compression frequency was highest in the DACO-CPR group (65.222.4 min1) compared with the unassisted CPR group (35.624.2 min1) and the dispatcher-assisted full CPR group (44.510.8 min1). Correct rescue ventilation was given in 3.111.1% (unassisted CPR) and 1.616.1% (dispatcher-assisted full CPR) of all ventilation attempts
Shimamoto 2015	2015	Japan	Standard vs CCO CPR	Registry study	20000	Bystander CPR Initiation	Chest compression CPR (CCCPR) is significantly associated with provision of bystander CPR compared with conventional CPR instruction. The CCCPR instruction group received bystander CPR more frequently than conventional CPR instruction group (70.0% versus 62.1%, $p < 0.001$). In a multivariable analysis, CCCPR dispatcher instruction was significantly associated with provision of bystander CPR compared with conventional CPR instruction
Williams 2006	2006	USA	Standard vs CCO CPR	Randomized Mannikin Simulation	54	Time from call to first compression	Compared to group traditional CPR (TCPR), group compression only (COCPR) initiated chest compressions faster (72 vs 117 sec, $p < 0.0001$), completed four cycles of CPR faster (168 vs. 250 sec, $p < 0.0001$), and paused for a smaller percentage of the resuscitation (13% vs. 36%, $p < 0.0001$). Only 9% of ventilation opportunities in the TCPR group yielded ventilations of the correct volume. There were no differences between groups in perceived understanding of CPR
Goto 2021	2021	Japan	Standard vs CCO CPR	Registry study	24947	Survival neurologically intact at 30 days	The 1-month CPC 1–2 rate was significantly higher in the conventional DA-CPR group than in the compression-only DA-CPR group (before propensity score (PS) matching, 7.5% [162/2169] versus 5.8% [1309/22778], $p < 0.01$; after PS matching, 7.5% (162/2169) versus 5.7% (123/2169), $p < 0.05$). Compared with compression-only DA-CPR, conventional DA-CPR was associated with increased odds of 1-month CPC 1–2 (before PS matching, adjusted odds ratio 1.39, 95% confidence interval [CI] 1.14–1.70, $p < 0.01$; after PS matching, adjusted odds
Goto 2022	2022	Japan	Standard vs CCO CPR (Paeds)	Record Review	8172	Survival neurologically intact at 30 days	The 1-month CPC 1–2 rate was significantly higher in the dispatcher-assisted conventional CPR group than in the dispatcher-assisted compression-only CPR group (before propensity score matching, 5.7% [175/3077] vs. 3.1% [160/5095], $p < 0.0001$, adjusted odds ratio 2.48, 95% confidence interval 1.19–3.22; after propensity score matching, 6.0% [156/2618] vs. 2.6% [69/2618], $p < 0.0001$,
Trethewey 2019	2019	UK	Terminology - simplified	Randomized Mannikin Simulation	330	Compression depth	Participants were randomized to 'at least 5 cm' (n = 109), 'approximately 5 cm' (n = 110) and 'hard and fast' (n = 111), in which mean chest compression depth was 40.9 mm (SD 13.8), 35.4 mm (SD 14.1), and 46.8 mm (SD 15.0) respectively. Mean difference in chest compression depth between 'at least 5 cm' and 'approximately 5 cm' was 5.45 (95% confidence interval (95% CI) 0.78–10.12), between 'hard and fast' and 'approximately 5 cm' was 11.32 (95% CI 6.65–15.99), and between 'hard and fast' and 'at least 5 cm' was 5.87 (95% CI

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Bray 2011	2011	Australia	Terminology - compression rate	Before/after registry study	3122	Not defined; Bystander CPR Initiation, survival to hospital and hospital discharge	rates of bystander CPR increased overall (45–55%, p < 0.001) and by initial rhythm (shockable 55–70%, p < 0.001 and non-shockable 40–46%, p = 0.01). In VF/VT OHCA, there were improvements in the number of patients arriving at hospital with a return of spontaneous circulation (ROSC) (48–56%, p = 0.02) and in survival to hospital discharge (21–29%, p = 0.002), for patients receiving bystander CPR. After adjusting for factors associated with survival, the period of time following the change in CPR instructions was a significant predictor of survival to hospital discharge in VF/VT patients (OR 1.57, 95% CI: 1.15–2.20, p = 0.005)
Riou 2018	2018	Australia	Terminology - language	Telephone record review	424	Caller agreement to perform CPR	Caller agreement was low (43%) when dispatchers used terms of willingness ("do you want to do CPR?"). Caller agreement was high (97% and 84% respectively) when dispatchers talked about CPR in terms of futurity ("we are going to do CPR") or obligation ("we need to do CPR"). In 38% (25/66) of calls where the caller initially declined CPR, the dispatcher eventually secured their agreement
Brown 2008	2008	USA	Terminology - put phone down	Randomized Mannikin Simulation	215	Compression quality***	Instructions to ''put the phone down'' had no effect on the quality of bystander-initiated dispatcher-assisted CPR.
Rodriguez 2014	2014	USA	Terminology - simplified	Randomized Mannikin Simulation (Paeds)	128	Compression depth	Randomized to receive one of two scripted dispatcher CPR instructions: (1) "Push as hard as you can" (PUSHHARD) or (2) "Push approximately 2 inches" (TWOINCHES) and do CPR on a simulated, 6-year-old pediatric manikin. The average CC depth (mean (SEM)) was greater in PUSH HARD compared to TWO INCHES (43 (1) vs. 36 (1) mm, p < 0.01) and met AHA targets more often (39% (25/64) vs. 20% (13/64), p = 0.02). CC rates trended higher in the PUSH HARD group (93 (4) vs. 82 (4) CC/min, p = 0.06). More providers did not achieve full
Mirza 2008	2008	USA	Terminology - simplified	Secondary data analysis from RCTs	332	Compression quality***	Subjects were randomized to either modified Medical Priority Dispatch System (MPDS) v11.2 protocol or a new simplified protocol. The main difference between the protocols was the instruction to ''push as hard as you can'' in the simplified protocol, compared to ''push down firmly 2 in. (5 cm)'' in MPDS. Instructions to ''push as hard as you can'', compared to ''push down firmly 2 in. (5 cm)'', resulted in improved chest compression depth (36.4mm vs. 29.7mm, p < 0.0001), and improved median proportion of chest compressions done to the correct depth (32% vs. <1%, p < 0.0001). No significant difference in median proportion of compressions with total release (100% for both) and average
Leong 2021	2021	Singapore	Terminology - simplified	Telephone record review	1296	Time from call to first compression	Standard protocol for DA-CPR in out-of-hospital cardiac arrests that involves the instruction 'push 100 times a minute 5 cm deep' versus a quality improvement initiative where the instruction was simplified to 'push hard and fast'. The mean time between instruction and first compression for the 'before' and 'after' groups was 34.36 seconds and 26.83 seconds, respectively (p < 0.001). Time to first compression was 238.62 seconds and 218.83 seconds in the 'before' and 'after' groups, respectively (p = 0.016). In the per-protocol analysis, the interval between instruction and compression was 37.19 seconds, 28.31 seconds and 32.40 seconds in the standard protocol, simplified protocol and 'own words' groups, respectively (p = 0.005). The need for paraphrasing was 60.4% in the standard protocol group and 81.5% in the simplified group (p < 0.001)

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Eisenberg-Chavez 2013	2013	USA	Undress instructions	Randomized Mannikin Simulation	99	Time from call to first compression	Time to first compression was 109s among the group randomized to instruction to remove clothing and 79s among those randomized to forgo instruction regarding clothing removal, (p < 0.001). Among those randomized to remove clothing instructions, mean compression depth was 41mm, compression rate was 97 per minute, and the percentage with complete compression release was 95%. Among those randomized to forgo clothing removal instruction, mean compression depth was 40mm, compression rate was 99 per minute, and the percentage with complete compression release was 91% (p > 0.05 for each CPR metric comparison)
Lee 2021	2021	Korea	Video vs. Audio	Randomized Mannikin Simulation	131	Mean proportion of adequate hand positioning	The mean proportion of adequate hand positioning was highest in V-DACPR with rapid transition (V-DACPR with rapid transition vs. C-DACPR: 92.7% vs. 82.4%, p = 0.03). The mean chest compression depth was deeper in both V-DACPR groups than in the C-DACPR group (V-DACPR with rapid transition vs. C-DACPR: 40.7 mm vs. 35.9 mm, p = 0.01, V-DACPR with delayed transition vs. C- DACPR: 40.9 mm vs. 35.9 mm, p = 0.01). Improvement in the proportion of adequate hand positioning was observed in the V-DACPR groups (r = 0.25, p < 0.01 for rapid transition and r = 0.19, p < 0.01 for delayed transition)
Linderoth 2021	2021	Denmark	Video vs. Audio	Cohort Study	838	Change in dispatchers' emergency response	Adding live video succeeded in 838 emergencies (82.2% of attempted video transmissions) and follow-upwas possible in 700 emergency calls. The dispatchers' assessment of the patients' condition changed in 51.1% of the calls (condition more critical in 12.9% and less critical in 38.2%), resulting in changed emergency response in 27.5% of the cases after receiving the video (OR 1.58, 95% CI: 1.30–1.91) compared to calls without video. Video was added more frequently in cases with sick children or unconscious patients compared with normal emergency calls. The dispatcher recognized other or different disease/trauma in 9.9% and found that patient care, such as the quality of cardiopulmonary resuscitation, obstructed airway or position of the patient, improved in 28.4% of the emergencies. Only 111 callers returned the
Lee 2020	2020	Korea	Video vs. Audio	Retrospective Cohort Registry study	1720	Survival to hospital discharge	A total of 1720 eligible OHCA patients (1489 and 231 in the audio and video groups, respectively) were evaluated. The median ITI was 136 s in the audio group and 122 s in the video group (p = 0.12). The survival to discharge rates were 8.9% in the audio group and 14.3% in the video groups (p < 0.01). Good neurological outcome occurred in 5.8% and 10.4% in the audio and video groups, respectively (p < 0.01). Compared to the audio group, the AORs (95% CIs) for survival to discharge, good neurological outcome and early ITI of the video group
Lee 2011	2011	Korea	Video vs. Audio	Randomized Mannikin Simulation	138	Not defined; Compression quality***	For the video group, the chest compression rate was more optimal (99.5 min?1 vs. 77.4 min?1, P < 0.01) and the time from the initial phone call to the first compressions was shorter (184 s vs. 211 s,P < 0.01). The depth of compressions was deeper in the audio group (31.3mm vs. 27.5mm, P = 0.21), but neither group performed the recommended depth of compression. The hand positions for compression were more appropriate in the video group (71.8% vs. 43.6%, P = 0.01). As many as 71.8% of the video group had no 'hands-off' events when
Yang 2009	2009	Taiwan	Video vs. Audio	Randomized Mannikin Simulation	96	Compression quality***	Chest compressions among the video group were faster (median rate 95.5 vs. 63.0 min1, p < 0.01), deeper (median depth 36.0 vs. 25.0 mm, p < 0.01), and of more appropriate depth (20.0% vs. 0%, p < 0.01). The video group had more "hands-off" time (5.0 vs. 0 second, p < 0.01), longer time to first chest compression (145.0 vs. 116.0 seconds, p < 0.01) and total instruction time

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Bolle 2009	2009	Norway	Video vs. Audio	Randomized Mannikin Simulation (HS Students)	180	Not defined; "time to" and compression quality	The median CPR time without chest compression ('hands-off time') was shorter in the video-call group vs. the audio-call group (303 vs. 331 s; P=0.048), but the median time to first compression was not shorter (104 vs. 102 s; P50.29). The median time to first ventilation was insignificantly shorter in the video-call group (176 vs. 205 s; P50.16). This group also had a slightly higher proportion of
Johnsen 2008	2008	Norway	Video vs. Audio	Qualitative after simulated calls	6	N/A (Qualitative)	Video-calls influenced the information basis and understanding of the dispatchers. The dispatchers experienced that (1) video-calls are useful for obtaining information and provides adequate functionality
Peters 2022	2022	Belgium	Video vs. Audio (Paeds)	Randomized Mannikin Simulation	120	Overall CPR Performance Score	Of 255 candidates assessed for eligibility, 120 subjects were randomly assigned to 1 of the 4 following groups: untrained telephone-guided (U-T; n = 30) or video-guided (U-V; n = 30) groups and trained telephone-guided (T-T; n = 30) or video-guided (T-V; n = 30) groups. Cardiac arrest was appropriately identified in 86.7% of the U-T group and in 100% in the other groups (P = 0.0061). Hand positioning was adequate in 76.7% of T-T, 80% of T-V, and 60% of U-V, as compared with 23.4% of the U-T group (P = 0.0001). Fewer volunteers managed to deliver 2 rescue breaths/cycle (P = 0.0001) in the U-T (16.7%) compared with the U-V (43.3%), the T-T (56.7%), and the T-V groups (60%). Subjects in the video groups had a lower fraction of minute to ventilate as compared with the telephone
Kim 2021	2021	Korea	Video vs. Audio + drones	Exploratory sequential MMR	24	Not defined: Overall CPR Performance	Video-based instruction was found to be more effective in the number of chest compressions ($p < 0.01$), chest compression rate ($p < 0.01$), and chest compression interruptions ($p<0.01$). The accuracy of the video group for the chest compression region was high (p = 0:05). Participants' qualitative experiences were divided into three categories: ``unfamiliar but beneficial experience,'' ``met helper during a desperate and embarrassing situation,'' and
OngMEH 2022	2022	Singapore	DA-CPR Implementation	Randomized Clinical Trial	170,687	Survival to hospital discharge/30th day survival post-arrest	Before-after comparison showed that survival to discharge was higher in the 'implementation' period in all three groups: comprehensive odds ratio (OR) 1.09, 95% confidence interval (CI; [1.0–1.19]); basic OR 1.14, 95% CI (1.08–1.2); and control OR 1.25, 95% CI (1.02–1.53). Comparing between groups, the comprehensive group had significantly higher change in BCPR (comprehensive vs control ratio of OR 1.86, 95% CI [1.66–2.09]; basic vs control ratio of OR 0.94, 95% CI [0.85–1.05]; and comprehensive vs basic ratio of OR 1.97, 95% CI [1.87–2.08]) and survival with favorable neurological outcome (comprehensive vs basic ratio of OR 1.2, 95% CI [1.04–1.39])
						*composite outcome score based on time to first compression, hand position, chest	
						**times to identification of cardiac arrest, time to the first compression, time to patient's address verification andthe time	
						***chest compression rate, depth, and the proportion of compressions without error, with	