Effect of Real-Time Instructor Feedback during Layperson CPR Training: A Prospective Cluster-Randomized Trial

So Yeon Kong¹, Kyoung Jun Song², Sang Do Shin¹, Young Sun Ro¹, Helge Myklebust³, Tonje Soraas Birkenes³, Tae Han Kim¹, Kwan Jin Park⁴

¹Seoul National University Hospital, ² Seoul National University Boramae Medical Center, ³Laerdal Medical, Stavanger, Norway, ⁴Chungbuk National University Hospital

Background

- Evidence supporting delivery of quality CPR is growing and significant attention has been focused on improving bystander CPR education for laypeople.
- The aim of this randomized trial was to measure improvement of CPR quality with objective, real-time, instructor feedback during CPR training compared to conventional feedback.

Methods

- We performed a cluster randomized trial of community CPR training classes at Nowon District in Seoul, Korea.
- CPR training classes, which were approximately one-hour course consisting of video-based dispatcher telephone CPR training, were randomized into either intervention (objective, real-time, instructor feedback based on the QCPR[®] Classroom device, Figure 1) or control (conventional, instructor judgement-based feedback) group.
- The primary outcome was total CPR score, a measure of chest compression quality. Second outcomes were individual CPR performance parameters, including compression rate, depth, and release.
- Generalized linear mixed models were used to analyze the outcome data, accounting for both random and fixed effects.

Figure 1. Display of QCPR Classroom real-time CPR feedback

Results

- For final analysis, a total of 149 training sessions (2,613 trainees) were randomized into 70 intervention (1,262 trainees) and 79 control (1,351 trainees) groups (Figure 2).
- Overall, a significantly higher total CPR performance score was observed in trainees in QCPR-based feedback group compared to conventional feedback group throughout the course of the CPR trainings (mean difference 3.2; p=0.02).
- Average compression depth (mean difference 1.0 mm; p=0.09), percent adequate depth (mean difference 3.4%; p=0.08) and percent acceptable release (mean difference 2.8%; p=0.08) also showed trends toward improvement in the QCPR feedback group compared to the conventional group.

Conclusions

Objective, real-time instructor feedback improves the quality of layperson's CPR performance.

Figure 2. Flow of participants through the trial

Table 1. Baseline demographics of the participants

Variables	CPR Training			p-value
	All	QCPR-based Feedback	Conventional Feedback	
	N	N	N	
Total Trainees	2,613	1,262	1,351	
Number of Classes	147	70	77	
Sex				0.06
Male	1,105 (42.3%)	557 (44.1%)	548 (40.6%)	
Female	1,508 (57.7%)	705 (55.9%)	803 (59.4%)	
Age group, years				0.15
19-29	598 (22.9%)	287 (22.7%)	311 (23.0%)	
30-39	470 (18.0%)	215 (17.0%)	255 (18.9%)	
40-49	633 (24.2%)	294 (23.3%)	339 (25.1%)	
50-59	563 (21.5%)	278 (22.0%)	285 (21.1%)	
>60	349 (13.4%)	188 (14.9%)	161 (11.9%)	
Median (IQR)	44 (31-54)	44 (31-54)	43 (31-54)	0.13
Employment Status				<0.01
Yes	2,187 (83.7%)	1,095 (86.8%)	1,092 (80.8%)	
No	208 (8.0%)	87 (6.9%)	121 (9.0%)	
Unknown	218 (8.3%)	80 (6.3%)	138 (10.2%)	
Instructor				<0.01
A	1,030 (39.4%)	537 (42.6%)	493 (36.5%)	
B	917 (35.1%)	497 (39.4%)	420 (31.1%)	
C	666 (25.5%)	228 (18.1%)	438 (32.4%)	
No. of trainees/class (Median, IQR)	10 (5-17)	10 (5-16)	10 (5-17)	0.74
No. of feedback given per class	7(5-9)	8 (5-12)	6 (5-8)	<0.01

Table 2. Quality of CPR performance outcomes by intervention group

	QCPR Feedback		Conventional Feedback		Between Group Difference (95% CI)	p-value
	Crude Mean (SD) (N = 1,262)	Model-Based ¹ Mean (95% CI) (N = 1,262)	Crude Mean (SD) (N = 1,351)	Model-Based ¹ Mean (95% CI) (N = 1,351)		
Total Score						
Baseline (Session 1)	77.6 (29.6)	79.2 (77.2 to 81.1)	75.9 (30.8)	76.3 (74.4 to 78.2)	2.9 (-0.3 to 5.5)	0.03
Session 2	90.5 (18.8)	92.1 (90.1 to 94.1)	87.1 (22.5)	87.4 (85.5 to 89.3)	4.6 (2.1 to 7.2)	<0.001
Session 3	92.6 (15.6)	94.2 (92.2 to 96.2)	90.5 (19.4)	90.8 (88.9 to 92.7)	3.4 (0.8 to 6.0)	0.01
Session 4	88.3 (19.0)	89.9 (87.9 to 91.9)	83.7 (24.3)	84.0 (82.1 to 85.9)	5.9 (3.3 to 8.5)	<0.001
End of the session (Session 5)	88.8 (19.5)	90.4 (88.4 to 92.4)	83.9 (24.9)	84.3 (82.4 to 86.2)	6.1 (3.5 to 8.7)	<0.001
Δ Baseline to session 5	11.2 (29.1)	11.2 (9.2 to 13.2)	8.0 (29.1)	8.0 (6.0 to 9.9)	3.2 (0.4 to 6.0)	0.02
Average Compression Rate (per minute)						
Baseline (Session 1)	108.3 (6.3)	108.8 (107.7 to 109.9)	109.0 (7.3)	109.1 (108.0 to 110.2)	-0.3 (-1.1 to 0.4)	0.36
Session 2	111.5 (6.2)	112.0 (110.9 to 113.1)	111.5 (6.1)	111.6 (110.5 to 112.7)	0.4 (-0.3 to 1.1)	0.3
Session 3	110.2 (5.2)	110.7 (109.6 to 111.8)	109.5 (7.2)	109.6 (108.6 to 110.7)	1.1 (0.4 to 1.8)	<0.01
Session 4	113.9 (5.5)	114.4 (113.3 to 115.5)	114.0 (6.8)	114.0 (113.0 to 115.1)	0.4 (-0.3 to 1.1)	0.29
End of the session (Session 5)	114.4 (6.1)	114.9 (113.8 to 116.0)	115.3 (7.8)	115.3 (114.3 to 116.4)	0.4 (-1.2 to 0.3)	0.23
Δ Baseline to session 5	6.1 (7.5)	6.1 (5.6 to 6.6)	6.2 (9.4)	6.2 (5.7 to 6.7)	-0.1 (-1.1 to 0.7)	0.77
Average Compression Depth (mm)						
Baseline (Session 1)	55.6 (12.3)	56.8 (55.8 to 57.7)	55.0 (12.3)	56.0 (55.1 to 56.9)	0.8 (-0.5 to 2.0)	0.23
Session 2	61.7 (10.6)	62.9 (62.0 to 63.9)	60.0 (10.7)	60.9 (60.0 to 61.8)	2.0 (0.7 to 3.2)	<0.01
Session 3	61.6 (10.6)	62.8 (61.8 to 63.7)	60.1 (10.8)	61.1 (60.2 to 62.0)	1.7 (0.5 to 3.0)	<0.01
Session 4	60.9 (10.2)	62.0 (61.1 to 63.0)	59.4 (10.3)	60.3 (59.4 to 61.2)	1.7 (0.4 to 3.0)	<0.01
End of the session (Session 5)	59.8 (10.7)	60.9 (60.0 to 61.9)	58.2 (10.8)	59.2 (58.3 to 60.1)	1.7 (0.5 to 3.0)	<0.01
Δ Baseline to session 5	4.1 (9.1)	4.1 (3.3 to 5.0)	3.2 (8.9)	3.2 (2.4 to 4.0)	1.0 (-0.2 to 2.1)	0.09
Percent Adequate Depth						
Baseline (Session 1)	67.6 (39.9)	69.9 (67.1 to 72.6)	66.8 (40.0)	68.9 (66.3 to 71.6)	0.9 (-2.7 to 4.6)	0.62
Session 2	86.1 (28.8)	88.4 (85.6 to 91.2)	82.3 (31.4)	84.5 (81.8 to 87.1)	3.9 (0.3 to 7.6)	0.03
Session 3	85.2 (30.2)	87.5 (84.7 to 90.3)	82.9 (31.7)	85.0 (82.3 to 87.7)	2.5 (-1.2 to 6.1)	0.18
Session 4	85.4 (27.5)	87.7 (84.9 to 90.4)	81.4 (31.6)	83.5 (80.8 to 86.2)	4.2 (0.5 to 7.8)	0.02
End of the session (Session 5)	82.7 (32.0)	85.0 (82.2 to 87.7)	78.5 (35.1)	80.7 (78.0 to 83.3)	4.3 (0.7 to 7.9)	0.02
Δ Baseline to session 5	15.1 (38.2)	15.1 (12.4 to 17.8)	11.7 (37.5)	11.7 (9.1 to 14.3)	3.4 (-0.4 to 7.1)	0.08
Percent Acceptable Release						
Baseline (Session 1)	79.5 (32.2)	80.2 (77.9 to 82.5)	79.4 (32.6)	79.1 (76.8 to 81.3)	1.1 (-1.5 to 3.8)	0.4
Session 2	83.8 (29.6)	84.5 (82.2 to 86.8)	80.4 (31.7)	80.0 (77.8 to 82.3)	4.4 (1.8 to 7.1)	<0.01
Session 3	89.7 (23.9)	90.4 (88.1 to 92.7)	89.1 (23.7)	88.8 (86.5 to 91.0)	1.6 (-1.0 to 4.2)	0.23
Session 4	85.2 (27.3)	85.9 (83.6 to 88.2)	82.7 (28.9)	82.3 (80.1 to 84.6)	3.5 (0.9 to 6.2)	<0.01
End of the session (Session 5)	84.0 (28.7)	84.7 (82.4 to 87.0)	81.1 (30.8)	80.8 (78.6 to 83.0)	3.9 (1.2 to 6.5)	<0.01
Δ Baseline to session 5	4.5 (27.3)	4.5 (2.3 to 6.7)	1.7 (29.6)	1.7 (-0.4 to 3.8)	2.8 (-0.3 to 5.8)	0.08

Abbreviations: SD=standard deviation; CI=confidence interval

¹These are values based on parameter estimates from the mixed-effects models adjusted for age, sex, and employment status as fixed effect and class and trainer as random effects.