

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Interventions from the HeartRescue Project in North Carolina

Community:

- Expansion for certificate-based CPR classes.
- Mass training events including the North Carolina State Fair, NASCAR races, and athletic events.
- Public service announcements running a 30-second spot in movie theatres in North Carolina where bystander CPR and survival rates were low.
- Local strategies: CPR Olympics with middle and high schools, health fairs, festivals, churches, schools, and businesses trainings.
- Use of media to cover events to inform the public of the work and steps of CPR.
- Provision of community grants to implement CPR training programs.
- Development of community-based resources: handouts, videos, websites, and others.
- Advertisement materials that have the steps for CPR: tote bags, book marks, writing pads, pens, t-shirts, heart stress balls.
- Community presentations at churches, rotary clubs, Knights of Columbus, etc.

Emergency medical services and emergency dispatch centers:

- Data tracking and feedback.
- Training for 911 centers to recognize sudden cardiac arrest and give CPR instruction over the phone.
- Targeted training effort with emergency dispatch centers across North Carolina offering a 2.5-hour training to improve sudden cardiac arrest call handling. Trained 400 telecommunicators in 20 counties over 3 months.
- Training in resuscitation academies described below.

Resuscitation Academies:

Resuscitation Academies were run across the state. Thousands of healthcare providers from every link in the chain of survival attended these educational events. RACE CARS staff worked with local planning committees that included emergency medical services, fire, hospitals, and telecommunications representation. Agendas were created based on the local data and needs assessment. Agenda topics included every link in the chain of survival.

Topics Included:

- Launching community sudden cardiac arrest programs, including sudden cardiac arrest recognition, calling 911, performing compressions-only CPR, and other literature on cardiovascular emergencies. Survivor celebrations, mass training, compression-only CPR programs in schools and at athletic events. Placement of AEDs, reporting AED locations to 911 centers, and AED maintenance.
- EMD training for early SCA recognition, compression-only CPR instruction, and monitoring performance measures—time from call to recognition, time from call to instruction, time of call to first compression.
- First responder – Fire's role in the resuscitation, including concepts of team resuscitation and high-performance CPR.
- Emergency medical services – team resuscitation, high-performance CPR, on-scene resuscitation, monitoring and quality-improvement efforts, grief support, cooling therapy, destination protocols, calling the resuscitation at the scene, how long to run the resuscitation.
- Hospital management of the TH patient, including induction, maintenance, rewarming, and other goal-directed therapies. How to teach in-hospital cardiovascular patients and families and non-clinical personnel compression-only CPR. Team resuscitation for in-hospital response of SCA patients.
- General topics for all: regionalization of SCA care, the science behind a resuscitation.

- a. Train the Trainer—supplied guidance and resources for EMS to train their staff and any fire departments that were a part of their resuscitation attempts.
- b. Resuscitation Tool Kits—covers all aspects of implementing a team approach to resuscitation.
- c. Training Videos—the topics from the Resuscitation Academies were recorded as an online resource, including the slide sets, Q&A, videos, and a certificate of completion.

Hospitals:

- Data tracking and feedback, see also Resuscitation Academies above.

Legislation:

- Passing of a law that required all high school students to be trained in CPR as a graduation requirement and placement and training for AEDs in all state buildings.
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eTable 2. Demographic characteristics in the included counties, the excluded counties, in North Carolina, and in the United States

Characteristic	Included counties (n=11)	Not included counties that reported to CARES 2010-2013 (n= 51)	Remaining counties in North Carolina (n=38)	North Carolina	US
Total population	2,592,495	5,240,701	2,015,721	9,848,917	316,497,531
Square Miles	4,694	26,592	17,331	48,618	3,531,905
Cardiac arrests per 100,000 population	47.5	27.2	-	-	-
% Male	48.5	48.9	48.9	48.7	49.2
Median Household Income	\$47,020	\$42,161	\$39,077	\$46,334	\$53,046
Household Income Quintile Upper Limits					
Q1	\$20,549	\$17,971	\$16,325	\$19,418	\$21,734
Q2	\$37,213	\$33,340	\$30,628	\$36,373	\$41,630
Q3	\$58,776	\$52,299	\$48,967	\$57,801	\$66,487
Q4	\$91,669	\$82,561	\$77,925	\$92,305	\$106,492
% High School	88.3	84.0	83.4	84.9	86.0
% College	40	23.3	21.6	27.3	28.8
Median Age	40	40	43	37	37
Hospitals per 100,000 population	1.0	1.3	1.8	1.3	1.8

CARES, Cardiac Arrest Registry to Enhance Survival. Q, quartile. The total resident population and demographic characteristics in each county was determined through information reported by the US Census 2010 and American Community Survey 5 year estimates for 2009-2013.

eTable 3. Outcomes among defibrillated patients according to who initiated CPR and who performed defibrillation

Who initiated CPR and who performed defibrillation	No.	% (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Return of spontaneous circulation				
EMS initiated CPR and EMS defibrillation (n=193)	70	36.3 (29.8-43.3)	1.00 (reference)	1.00 (reference)
First-responder-initiated CPR and EMS defibrillation (n=207)	86	41.6 (35.0-48.4)	1.25 (0.84-1.87)	1.22 (0.81-1.83)
First-responder-initiated CPR and first-responder defibrillation (n=423)	188	44.4 (39.8-49.2)	1.41 (0.99-2.00)	1.38 (0.97-1.96)
Bystander-initiated CPR and EMS defibrillation (n=339)	144	42.5 (37.3-47.8)	1.30 (0.90-1.87)	1.28 (0.89-1.85)
Bystander-initiated CPR and first-responder defibrillation (n=336)	143	42.6 (37.4-47.9)	1.30 (0.90-1.88)	1.29 (0.89-1.86)
Bystander-initiated CPR and bystander defibrillation (n=111)	58	52.3 (42.9-61.4)	1.92 (1.20-3.09) ^a	1.93 (1.20-3.11) ^a
Survival to discharge				
EMS initiated CPR and EMS defibrillation (n=193)	29	15.0 (10.6-20.8)	1.00 (reference)	1.00 (reference)
First-responder-initiated CPR and EMS defibrillation (n=207)	32	15.5 (11.1-21.1)	1.03 (0.60-1.79)	0.99 (0.57-1.73)
First-responder-initiated CPR and first-responder defibrillation (n=423)	105	24.8 (20.9-29.2)	1.87 (1.19-2.94) ^a	1.72 (1.09-2.73) ^a
Bystander-initiated CPR and EMS defibrillation (n=339)	70	20.7 (16.7-25.3)	1.47 (0.92-2.37)	1.37 (0.85-2.22)
Bystander-initiated CPR and first-responder defibrillation (n=336)	80	23.8 (19.6-28.7)	1.77 (1.11-2.82) ^a	1.65 (1.03-2.66) ^a
Bystander-initiated CPR and bystander defibrillation (n=111)	37	33.3 (25.2-42.6)	2.83 (1.62-4.94) ^a	3.08 (1.74-5.46) ^a
Survival with favorable neurologic outcome				
EMS initiated CPR and EMS defibrillation (n=193)	29	15.0 (10.6-20.8)	1.00 (reference)	1.00 (reference)
First-responder-initiated CPR and EMS defibrillation (n=207)	27	13.0 (9.1-18.4)	0.85 (0.48-1.49)	0.81 (0.46-1.44)
First-responder-initiated CPR and first-responder defibrillation (n=423)	91	21.5 (17.9-25.7)	1.55 (0.98-2.45)	1.40 (0.88-2.24)
Bystander-initiated CPR and EMS defibrillation (n=339)	64	18.9 (15.1-23.4)	1.32 (0.82-2.13)	1.21 (0.74-1.97)

Bystander-initiated CPR and first-responder defibrillation (n=336)	76	22.6 (18.5-27.4)	1.65 (1.03-2.65) ^a	1.53 (0.95-2.47)
Bystander-initiated CPR and bystander defibrillation (n=111)	37	33.3 (25.2-42.6)	2.83 (1.62-4.94) ^a	3.20 (1.79-5.69) ^a

CPR, cardiopulmonary resuscitation; EMS, emergency medical services; OR, odds ratio; CI, confidence interval. Observations with missing values were excluded from the analyses (n=39). A total of 1609 observations were included in the logistic regression models. Adjusted estimates were adjusted for age and sex. ^aP value <0.05.

eTable 4. Who initiated CPR and who performed defibrillation among survivors according to year

Characteristics, No. (%)	2010	2011	2012	2013	Total	P value
EMS initiated CPR and EMS defibrillation	7/64 (10.9)	5/85 (5.9)	11/109 (10.1)	7/111 (6.3)	30/369 (8.1)	0.51
First-responder initiated CPR and EMS defibrillation	4/64 (6.3)	13/85 (15.3)	8/109 (7.3)	8/111 (7.2)	33/369 (8.9)	0.51
First-responder initiated CPR and first-responder defibrillation	29/64 (45.3)	30/85 (35.3)	27/109 (24.8)	23/111 (20.7)	109/369 (29.5)	<0.01
Bystander initiated CPR and EMS defibrillation	9/64 (14.1)	12/85 (14.1)	23/109 (21.1)	32/111 (28.8)	76/369 (20.6)	<0.01
Bystander initiated CPR and first-responder defibrillation	5/64 (7.8)	18/85 (21.2)	32/109 (29.4)	28/111 (25.2)	83/369 (22.5)	<0.01
Bystander initiated CPR and bystander defibrillation	10/64 (15.6)	7/85 (8.2)	8/109 (7.3)	13/111 (11.7)	38/369 (10.3)	0.57

CPR, cardiopulmonary resuscitation; EMS, emergency medical services. Analyses were performed using imputed datasets and included all patients who were defibrillated and survived to discharge (n=369) during the whole study period (2010-2013). P value for trend.