

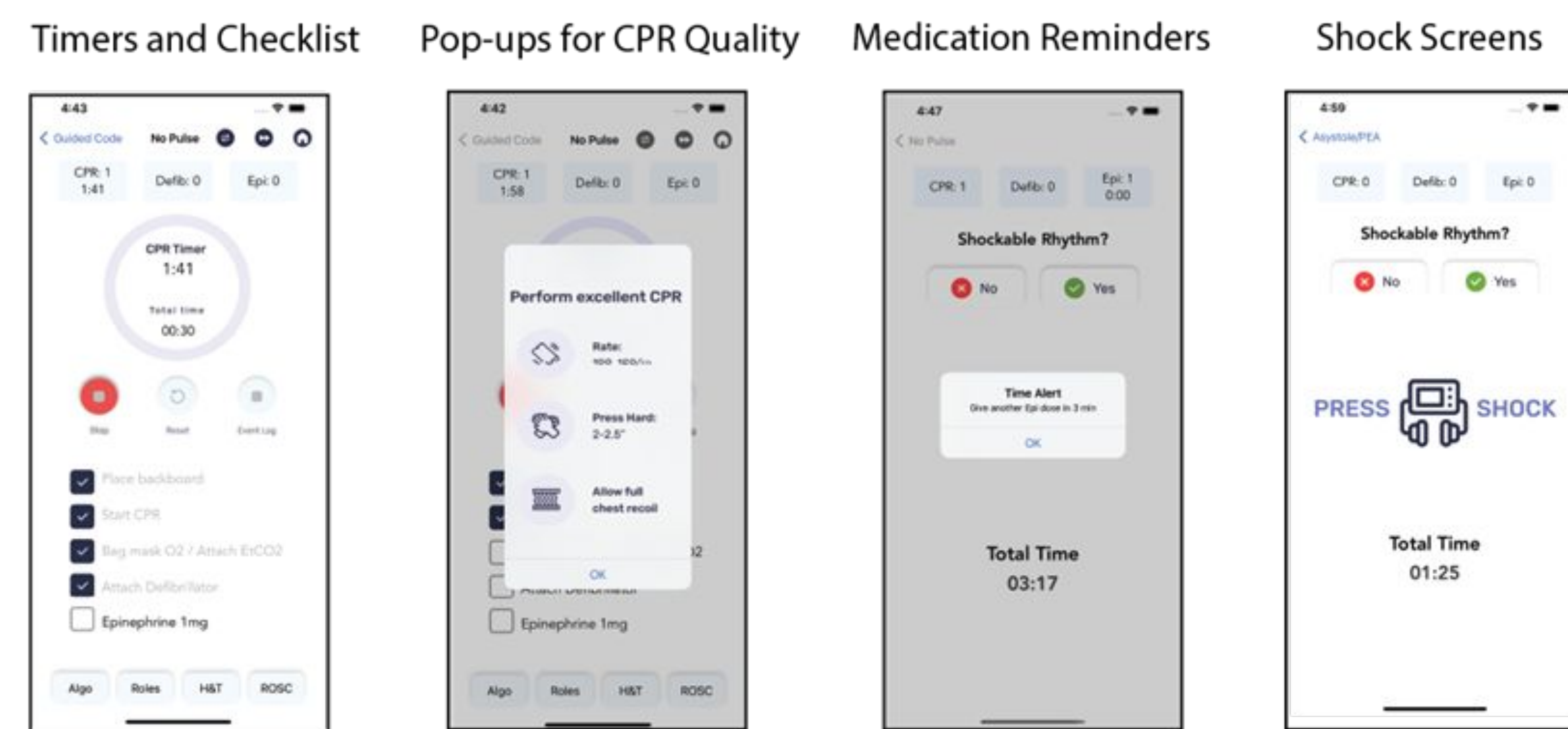
Michael Senter-Zapata, MD^{1,2,11}, Dylan V. Neel, PhD¹, Isabella Colocci, BA¹, Afaf Alblooshi, MD, PhD^{3,4}, Faten Abdullah M. AlRadini, MD^{3,5}, Brian Quach, BA^{2,3}, Samuel Lyon, MD¹, Maxwell Coll, MD^{1,2}, Andrew Chu, MD, MPH, MBA^{7,10}, Katharine W Rainer, MD⁸, Beth Waters, MSN, RN, CPEN⁹, Christopher W. Baugh, MD, MBA^{1,2}, Roger D. Dias, MD, PhD, MBA^{1,2,3}, Haipeng Zhang, DO, MMSc^{1,2,6}, Andrew Eyre, MD, MS^{1,2,3}, Eric Issebacher, MD, MSC^{1,10,11}, Jared Conley, MD, PhD, MPH^{1,10,11}, Narath Carlile, MD, MPH^{1,2}

¹Harvard Medical School, ²Brigham and Women's Hospital, ³STRATUS Center for Medical Simulation, ⁴United Arab Emirates University College of Medicine and Health Sciences, ⁵College of Medicine, Princess Nourah bint Abdulrahman University, ⁶Brigham Digital Innovation Hub, ⁷Stanford University School of Medicine, ⁸Beth Israel Deaconess Medical Center, ⁹Brigham and Women's Faulkner Hospital, ¹⁰Massachusetts General Hospital, ¹¹Healthcare Transformation Lab, Massachusetts General Hospital

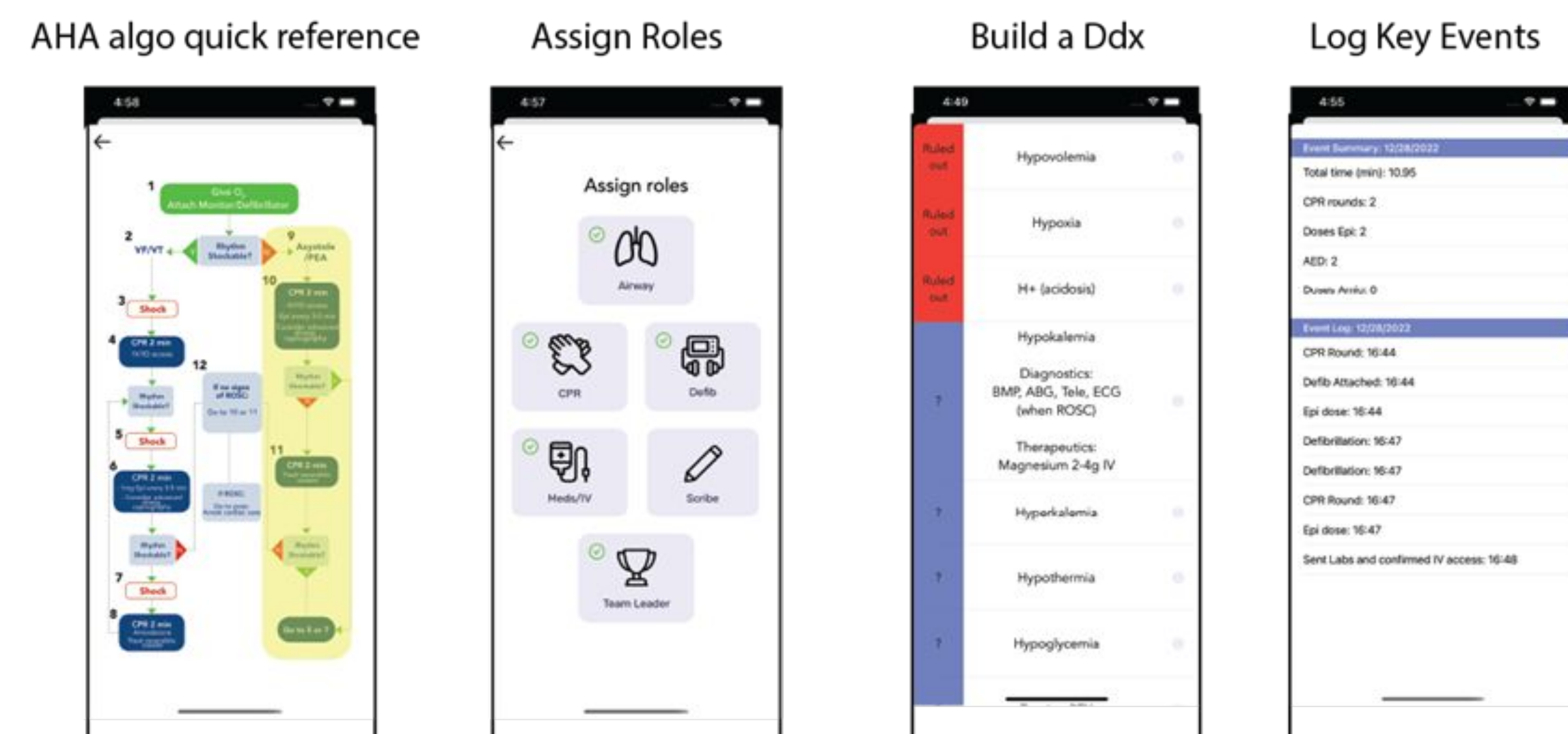
Background

Leading hospital “code” (cardiopulmonary arrest) teams is stressful for resident physicians, and variability in training and experience may result in inconsistent care and outcomes. Nearly all bedside aids like American Heart Association (AHA) advanced cardiovascular life support (ACLS) pocket cards and third-party ACLS mobile apps lack step-by-step guidance or reminders. Our team designed a guided ACLS mobile app to help trainees lead more effective hospital resuscitations and conducted a randomized controlled trial to assess user experience and performance according to 2020 AHA ACLS guidelines.

Step by Step Guidance 2020 AHA Algorithm

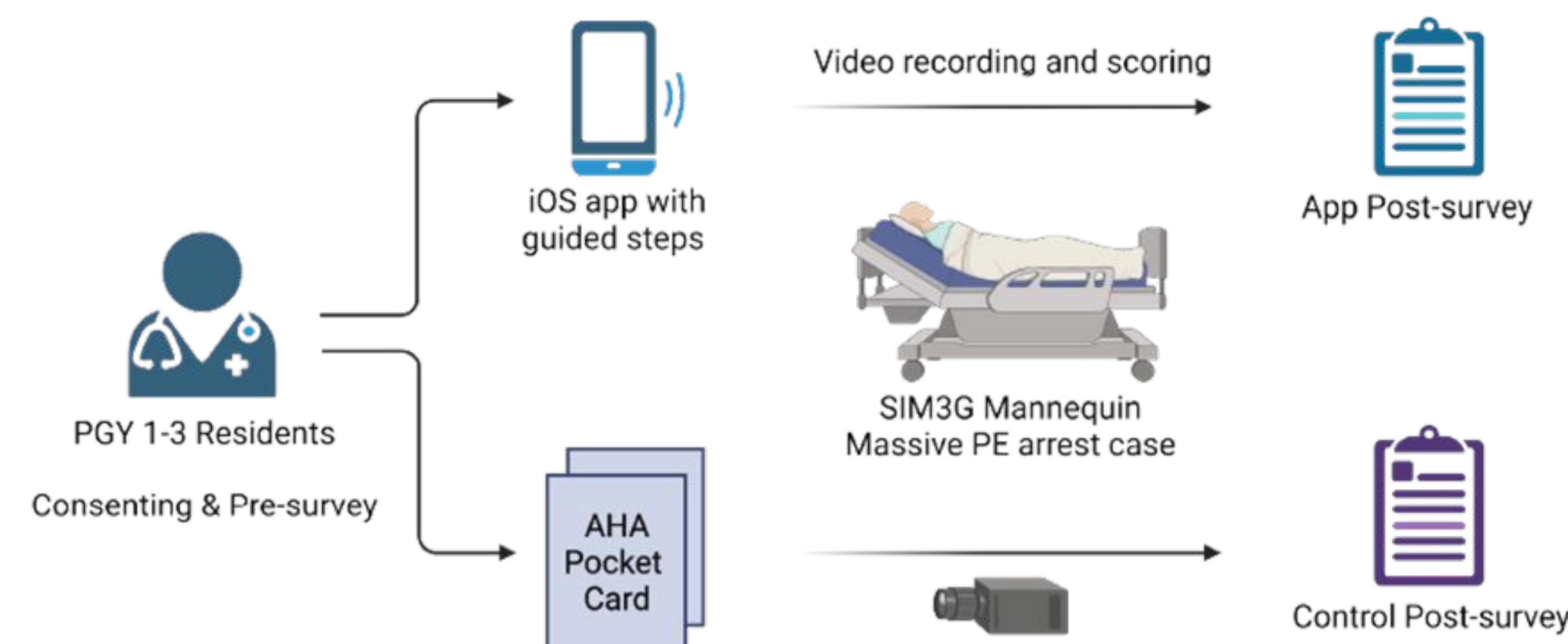


Useful Reference Buttons



Methods

- Internal Medicine, Emergency Medicine, Surgery, and Anesthesia residents (N = 46) were randomized to lead a simulated code for cardiac arrest due to massive pulmonary embolism using either AHA pocket cards (N = 22) or the ACLS app (N = 24).
- User experience was assessed via surveys.
- Code outcomes, guideline adherence, and errors were analyzed from video recordings.
- A focus group of 22 residents provided feedback.
- Statistical analysis was conducted using R software and included two-sided t-tests and Fisher exact tests.



Results

- App users showed significantly increased:
 - Confidence (1.0 vs 0.3; p = 0.005)
 - Backboard use (96% vs 27%; p <0.001)
 - End-tidal CO2 monitoring (58% vs 27%; p = 0.042)
 - Correct thrombolytic administration (54% vs 23%; p = 0.035)
 - Return of spontaneous circulation (50% vs 18%; p = 0.032)
- 100% of the participants would use the app.
- 82% preferred the guided app to AHA pocket cards.

Demographics	Control Group	App Group	P-value
PGY-1	12 (52%)	9 (38%)	0.38
PGY-2	8 (39%)	12 (50%)	0.65
PGY-3	2 (9%)	3 (12%)	1
Internal Medicine	17	19	1
Anesthesia	2	1	0.6
Emergency Medicine	2	2	1
Surgery	1	2	1
Previous code experience	3 (13.6%)	6 (25%)	0.48
Pre-code stress	3.6 + 0.12	3.6 + 0.12	0.685
Pre-code confidence	1.5 + 0.15	1.5 + 0.15	0.928

Code Performance	Control Group	App Group	P-value
Backboard Placement N (%)	6 (27.3%)	23 (95.8%)	<0.0001
CPR Rate Correction (N) %	16 (72.7%)	16 (66.7%)	0.655
Time to CPR Correction in sec (Mean ± STdev)	119 + 94	135 + 168	0.94
CPR Depth Correction (N) %	11 (57.9 %)	9 (45.0%)	0.527
EtCO2 Use (N) %	6 (27.3%)	14 (58.3%)	0.033
Bag Mask Rate Correction (N) %	11 (50.0%)	15 (62.5%)	0.393
Defib Pads Placement (N) %	19 (86.4%)	23 (95.8%)	0.336
Correct Diagnosis (N) %	7 (31.8%)	14 (58.3%)	0.071
Time to Correct Diagnosis in sec (Mean ± STdev)	584 + 165	498 + 176	0.605
Correct Intervention (tPa) (N) %	5 (22.7%)	13 (54.2%)	0.029
Time to tPa administration in sec (Mean ± STdev)	664 + 138	603 + 132	0.369
ROSC (N) %	4 (18.20%)	12 (50.0%)	0.024
Time to ROSC in sec (Mean ± STdev)	689.5 + 58.2	705.9 + 113.6	0.715
Verbalized H&Ts (N) %	16 (72.7%)	18 (75.0%)	0.861
Number of Errors per person (Mean ± SE)	0.95 + 0.30	0.38 + 0.13	0.175

Subjective Experience (low 1 to high 4)	Control Group	App Group	P-value
Stress Reduction (Mean ± SE)	0.56 + 0.19	0.83 + 0.12	0.224
Confidence Increase (Mean ± SE)	0.30 + 0.19	1 + 0.14	0.005

Conclusions

- The guided app improves user confidence and adherence to AHA ACLS guidelines and addresses the need for greater standardization in hospital code management.
- Validation studies are necessary to confirm its effectiveness in clinical practice.

The authors have no personal or financial conflicts of interest