Hidden in Plain Sight: A Crowdsourced Public Art Contest to Make Automated External Defibrillators More Visible

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Objectives. We sought to explore the feasibility of using a crowdsourcing study to promote awareness about automated external defibrillators (AEDs) and their locations.

Methods. The Defibrillator Design Challenge was an online initiative that asked the public to create educational designs that would enhance AED visibility, which took place over 8 weeks, from February 6, 2014, to April 6, 2014. Participants were encouraged to vote for AED designs and share designs on social media for points. Using a mixed-methods study design, we measured participant demographics and motivations, design characteristics, dissemination, and Web site engagement.

Results. Over 8 weeks, there were 13 992 unique Web site visitors; 119 submitted designs and 2140 voted. The designs were shared 48 254 times on Facebook and Twitter. Most designers–voters reported that they participated to contribute to an important cause (44%) rather than to win money (0.8%). Design themes included: empowerment, location awareness, objects (e.g., wings, lightning, batteries, lifebuoys), and others.

Conclusions. The Defibrillator Design Challenge engaged a broad audience to generate AED designs and foster awareness. This project provides a framework for using design and contest architecture to promote health messages. (*Am J Public Health.* 2014;104:2306–2312. doi:10.2105/AJPH.2014.302211)

In 1999, artists creatively painted cows that were then displayed around Chicago, Illinois.[1] This exhibit, the Cow Parade, has been hailed as the largest and most successful public art event in the world and has been seen by more than 100 million viewers.[1] Similar exhibits have displayed designed elephants, pianos, phone booths, and other inanimate objects.[2] Although none of these exhibits held social significance beyond cultural promotion, they reveal how art can engage the public,[2] and they suggest opportunities for using art to promote health.

Out-of-hospital cardiac arrest (OHCA) occurs more than 300 000 times each year and most victims do not survive.[3,4] Automated external defibrillators (AEDs) are the only publicly accessible device that can restore an effective rhythm.[5,6] AEDs provide visual and audible instructions about use and can be easily and effectively applied by untrained people.[7–10] However, AEDs are used in only 1% to 5% of OHCAs,[11–13] reflecting missed opportunities to save lives in occurrences when AEDs are available and accessible. Nearby AEDs may be unused because bystanders are unaware of their existence, unable to find them, or unsure of how to use them.[14–17]

We sought to assess the feasibility of using a crowdsourcing design contest to create public art for the spaces immediately surrounding AEDs, aiming to raise awareness about AEDs in general, and the memorability of the location of specific AEDs in particular. Crowdsourcing[18–21] involves soliciting the lay public to complete a task—in this case, turning members of the public into "citizen scientists."[22] The goal of this project was not to install the designs, but to test whether the public would create them, vote on them, and share them.

METHODS

The Defibrillator Design Challenge was a prospective mixed-methods crowdsourcing research project in which the public was tasked with creating, submitting, sharing, and voting on virtual artwork that could draw attention and promote education about AEDs. The contest was hosted on an online Web site (http://www.defibdesignchallenge.com) with mobile compatibility and took place over 8 weeks, from February 6, 2014 to April 6, 2014. The Web platform included a submission and voting portal, design gallery, rules, pledge, and prominently placed links for information about AED education. The University of Pennsylvania institutional review board approved this study.

The Defibrillator Design Challenge was a follow-up to the MyHeartMap Challenge, a crowdsourcing contest that sought to engage the public to locate and report the locations of AEDs.[20] The output from this project was a Web and mobile platform that illustrated AED geography. The Defibrillator Design Challenge expanded on the initial location work to explore ways of making AEDs more visible and noticeable to the walking public in their physical space rather than just on an app or Web site.

The contest was advertised and promoted via local and national print media, radio, television, targeted emails to art school across the Unites States, social media (e.g., Facebook, Twitter), and blogs. Promotion of the project was initiated 1 month before the contest start date and continued throughout the contest time frame. The contest launched with a press event at Amtrak's 30th Street Station (>4 million passengers use this station and it is Amtrak's third busiest station in the United States[23]) in Philadelphia, Pennsylvania, where a design was installed around an AED. The exhibit consisted of 4 chairs spelling out "#AED" which the public could sit on. The social media furniture was intended to, in

a very literal way, signal a conversation space (e.g., # = hashtag) and spell out the abbreviation for "automated external defibrillator." The letters A-E-D created a seating area around a kiosk with AEDs and information about the crowdsourcing contest.

Eligibility and Participation

To be eligible to submit or vote, participants were required to access the Web site and complete an online consent form and acknowledge that they were aged 18 years or older as of the contest start date. Individuals younger than 18 years, and employees, spouses, dependents, or immediate family members of the research team were ineligible to participate.

Eligible individuals could participate in 2 ways: submit AED designs and vote on AED designs.

Study Procedure

The task for designers was posted on the Web site as follows: "1) Your design should surround an AED, 2) Your design should draw attention to the AED, and 3) Your design should promote education/awareness about AEDs and/or cardiac arrest." Participants were also required to provide a description with their design to convey their intent or additional comments about the design.

Participants could "win" by popularity (i.e., highest cumulative points) or expert panel acknowledgment. Each design was eligible to receive points through votes by participants (this could occur once daily) or shares (unlimited) on Facebook and Twitter. Social sharing in this context involved the participant posting a link, image, and text about their contest entry on their Facebook page or Twitter feed. The intent was that designers could help disseminate AED education by sharing their designs on social media to a potentially large number of followers and friends within their social network. For the popularity prize, incentives for the individuals with the most points per design were as follows: Gold ($1000), Silver ($500), Bronze ($300), and 2 Honorable Mentions ($100).

We selected expert panel members before the contest and included designers, artists, and health care providers. Expert panel prizes ($100) were awarded by cumulative votes of the expert panel team, with each member selecting designs based on the uniqueness of the designs and whether it promoted education and awareness about AEDs or cardiac arrest. Expert panel members submitted votes each week of the contest.

Design Characteristics

To characterize design themes that could be used to develop future public health initiatives for AED awareness, designs were independently reviewed by 2 study personnel (Y. P. H., M. M. D.) and assigned a rating. A random sample of 25% of the designs was viewed to develop an iterative list of themes. These were then used to characterize each of the submitted designs. Study personnel also rated each design independently using a 5-point Likert scale (1 = poor to 5 = excellent) of how well the design achieved the contest tasks (e.g., draw attention, promote education and awareness).

AED Pledge

Because pledging has been used for promoting behavior change,[24,25] we sought to evaluate not just willingness to submit or vote on an AED design but reported wiliness to actually act in an emergency and use an AED if needed. We included a pledge displayed on a separate section of the Web site unassociated with design submission or voting. The pledge included the following text: "I pledge to be alert and aware of AED locations and to use one in the event of an emergency." Participants had the option of signing online anonymously or with their first and last names.

Crowdsourcing Metrics

We assessed participant age, AED knowledge, and reasons for participating with a brief survey required upon initially accessing the Web site. Measures of engagement (e.g., page views, time per page, source of Web traffic) were extracted using Google Analytics (http://www.google.com/analytics). We measured dissemination via cumulative votes and shares on Facebook and Twitter using the online software Opentracker (http://www.opentracker.net).

Analysis

Summary statistics were used to describe participant demographics, engagement, dissemination, and other crowdsourcing metrics. Design themes were identified iteratively and further characterized by sample representative quotes.

TABLE 1—Contest Engagement and Participant Demographics

Variable	No., Mean, or No. (%)
Web site	
Total page views, no.	53 784
Unique page views, no.	13 992
Average number of pages viewed, no.	4.93
Average time on page, min	1.33
Mobile users, no.	4207
Desktop users, no.	7743
Tablet users, no.	1301
Referral source	
Direct	7098
Television	122
Facebook	4030
Twitter	510
Others	2232
Geography	
United States	12 881
International	370
Voters–designers (n = 2140)	
Age, y	
18–24	667 (31)
25–29	303 (14)
30–39	387 (18)
40–49	271 (12)
50–59	252 (10)
≥ 60	260 (8)
Motivation	
Interest in cardiac arrest research/education	189 (9)
Personal connection to cardiac arrest	210 (10)
Told by a friend/family member	777 (36)
Fun	495 (23)
Contribute to an important cause	451 (21)
Win money	18 (0.8)
AED knowledge	
Yes	1697 (79)
No	443 (21)
Pledge (n = 414)	
First and last names provided	293 (82)
Anonymous	65 (18)

Note. AED = automated external defibrillator

RESULTS

Across 8 weeks, 13 992 unique visitors made 53 784 visits to the Defibrillator Design Challenge Web site (Table 1). Site visitors were primarily from the United States (13 622 [97%]) and represented 48 states.

Designer and Voter Demographics

There were 119 submitted designs, and 2140 participants voted on these entries and provided demographic information. Voting occurred on the study Web site and each participant could vote for each design once daily. A third of voters and designers, 667 (31%) were between the ages of 18 and 24 years, whereas 512 (22%) were aged 40 years or older. Most participants, 1697 (79%), indicated that they knew what an AED was before coming to the contest Web site. Of the designers or voters, 44% were motivated to participate because they wanted to "contribute to an important cause" or because the contest was "fun." Few designers or voters, 18 (0.8%), indicated that their participation was driven by an interest in winning money. Several participants mentioned donating the money if they won, and an expert panel winner declined the prize because the contest was intended for social good.

Design Characteristics

AED designs (n = 119) were submitted throughout the contest with 44 designs submitted in the first week and 7 designs submitted in the last week. These designs generated

FIGURE 1—Sample crowdsourced automated external defibrillator designs submitted to the defibrillator design challenge.

65 120 points during the contest time frame with 48 254 (74%) points resulting from social sharing on Facebook and Twitter.

Figure 1 displays sample AED designs that were submitted to the contest. Study personnel (Y. P. H., M. M. D.) independently rated all designs. Of all 119 submitted designs, 92 (77%) received a rating of good, very good, or excellent on one or both of the contest tasks (e.g., draw attention, promote education/awareness; Figure 2).

Several themes were repeated across designs, including self-empowerment (e.g., "You can save a life," "Anyone can use an AED"), AED use instructions (e.g., "Just turn it on"), AED location awareness (e.g., arrows, frames, lights), interactivity (e.g., maze, matching game), associations with life and death (e.g., "Let there be life," "Life, keep it blooming," "Don't make life a game of chance"), and objects (e.g., wings, hearts, lightning, lifebuoys; Table 2). Designers often identified how the contest informed them about AEDs. One participant remarked,

> I heard about this contest while I was watching the news at the gym. I didn't know what an AED was or even where to find one even though I spent many years in hospitals visiting my family member who had heart failure and an arrhythmia. I was mostly interested in the contest from the art aspect. But when I found out that Dallas star forward, Rich Peverley, had collapsed during a game and a defibrillator was used to save his life, I realized the importance of this challenge. I now understood how important it is for people to be able find AED'S easily and quickly.

Another participant commented that

> The terms AED or Defibrillator aren't all that familiar with me. I have to think about what those things are, honestly I didn't know what an AED was until I came to this site. I have a feeling much of the general public feels this way as well. The first thing I think of when I see a defibrillator is a doctor yelling "CLEAR!" then using the paddles on the patients.

AED Pledge

The section of the Web site with the pledge to use an AED in an emergency was viewed by 414 (3%) individuals. Of those visiting the page, 293 (82%) individuals signed the pledge using their first and last names and 65 (18%) individuals signed the pledge anonymously.

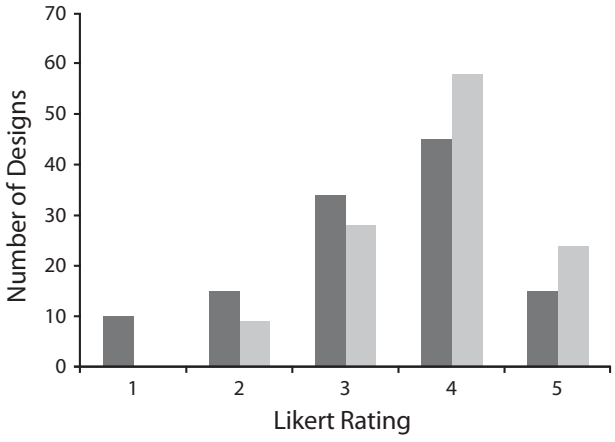
DISCUSSION

Bystander participation in resuscitation after cardiac arrest passes through several steps, each of which can represent a barrier to success (e.g., recognizing signs of arrest, calling 911, initiating cardiopulmonary resuscitation, knowing to look for an AED, locating an AED, using the AED).[26] The Defibrillator Design Challenge focused on AED education and enhancing AED location awareness. Using a logic model framework for the Challenge, the input was a crowdsourcing Web site, and the activities included engaging participants to submit, vote, and learn more about AEDs. The output was a series of designed AEDs, and the desired long-term impact was to improve the awareness of AEDs in general, and the location of specific AEDs in particular. This study has 3 main findings.

First, we successfully crowdsourced 119 AED designs and engaged a large audience of more than 13 000 individuals to participate and disseminate information about AEDs through 48 254 social media posts. Notably, the contest engaged a broad demographic with more than 20% of participants reporting being older than 40 years. Although many social media and technology-based initiatives are traditionally directed at younger populations, this study illustrates the potential to access multiple age groups through a social media–crowdsourcing project. Future work is needed to better understand when crowdsourcing or social media participants best fit the target audience of a public health initiative and when they differ—as these differences may impact the overall success, interpretation, or reach of the project.

Second, we identified themes that may be useful for future public health campaigns or initiatives that seek to raise awareness about AEDs. Although many of the designs submitted in this contest used conventional themes (e.g., hearts, electrocardiogram rhythm strips), others paired AEDs with unconventional objects (e.g., candy, lifebuoys, plants, graffiti, cartoon characters, video game characters, balloons) that could potentially draw attention to AEDs and make them more noticeable. To our knowledge, this study is the first to query the public about how to make AEDs more conspicuous, and our findings could be used to not only create AED designs in public places but also inform campaigns targeted at raising awareness of emergency health resources.

Third, we defined and collected several crowdsourcing metrics (e.g., participation demographics, motivations for participation) that could be useful for designing subsequent public health contests. Consistent with other reports of Internet behavior like the 90–9-1 principle (90% of online community participants view content, 9% edit content, and 1% actively create new content), this contest had many individuals who visited the Web site and observed but did not participate.[27]



Note. This figure illustrates subjective ratings (Likert scale 1–5; 1 = poor, 5 = excellent) of designs by the study team relative to how successful the design could be in promoting automated external defibrillator education and awareness (light gray bars) or how successful the design could be in drawing attention to an automated external defibrillator (dark gray bars).

FIGURE 2—Distribution of design ratings.

TABLE 2—Automated External Defibrillator Design Themes

Themes	Total Designs by Theme, No. (%)	Characteristics	Accompanying Text
AED use			
Who can use an AED?	19 (16)	People, superheroes, cartoon characters	"Anyone can use an AED!" "You can be a hero." "A bystander saved my life."
Who can AEDs be used on?	9 (8)	Youths, elderly, animals	"In a long hallway, a man clutches his chest. He falls to the floor. He's not breathing. In four minutes, permanent brain damage sets in. What do you look for?"
When should an AED be used?	15 (13)	Flat line ECG, unconscious and collapsed individuals	"The heart needs to pump. When it stops, an AED can give it another chance." "Only 2% of people survive cardiac arrest without an AED."
How should an AED be used?	14 (12)	Pads or paddles held in the air, pads or paddles placed on the chest	"1. Turn on 2. Follow prompts 3. Press shock button if instructed."
AED outcomes			
Positive, life	55 (46)	Video game "1-Up" symbol, flowers, suns, wings	"Saves lives." "Let there be life." "Keep it blooming."
Negative, death	5 (4)	Unconscious individuals, skeleton	"Left for dead." "Do not make life a game of chance."
AED locations			
Site specificity	6 (5)	Airport, library, school, fitness center, transit station, Philadelphia, PA	"[W]hen I was in school I saw a defibrillator case, and after I researched it I found out that there are public places that hold defibrillator cases like a school, transit stations, etc." "Identifying where an AED machine is located in a school can be difficult. Most of the time, the boxes blend in with the white painted walls."
Location awareness	31 (26)	Location tape, arrows, targets, other directional shapes, frames, neon lights, maps	"Located here." "Save a life here."
Associations			
Objects, icons, or slogans	20 (17)	Hearts, Life Savers Candy, lightning bolts, lifebuoys, cartoon characters, video game characters, balloons, graffiti, gifts, map pins, *LOVE Statue,* American Heart Association logo	"Got AED?" "Queen of AEDs." "How can you mend a broken heart?" "Keep calm and shock on." "As easy as 123."
Medical care	37 (31)	First aid crosses, ECG, stethoscopes, white coats, bandages, dummies	"People can save lives even if they are not a doctor."
Interactivity or gaming	4 (3)	Mazes, puzzles, matching game	"A game: in the form of a trivial labyrinth that will catch the attention of people on their regular way to work and make them memorize where and what the device is for." "Matching by the rhythm." "Left 4 Dead 2 is a game where you kill zombies and try and get from safe house to safe house without dying. There are health packs, pills, adrenaline shots, and defibrillators to keep you going from level to level."

Note. AED = automated external defibrillator; ECG = electrocardiogram.

Many crowdsourcing projects have involved monetary compensation for participants. The DARPA Network Challenge to find 10 moored red balloons across the United States offered a $40 000 dollar prize, the Qualcomm Tricorder X Prize to build a modern day Star Trek-esque device to monitor and diagnose health conditions offers a $10 million dollar prize, and Web sites such as Kaggle and Innocentive feature hundreds of health challenges offering a range of monetary awards.[28–31]

Other successful crowdsourcing efforts have featured games related to protein folding, or identifying malaria parasites in digitized thick smears–all for fun and no monetary reward.[32–34] Less is known about why participants engage in these crowdsourcing challenges and how much participation is driven by monetary rewards. In the Defibrillator Design Challenge, the grand prize was $1000 dollars, and expert panel prizes were $100 dollars. Few participants reported being motivated by money and most indicated they became involved to have fun or contribute to an important cause. In addition, the pledge was not linked with any incentive, and more than 80% of those who viewed this section of the Web site signed it and committed to using an AED in an emergency. Although participant behaviors may vary by task, our findings suggest that monetary rewards may be unnecessary in crowdsourcing contests. Instead, making a challenge "fun" through gamification and locating individuals who recognize the importance of addressing a problem or supporting a cause may be similarly beneficial.[35]

This study has several limitations. Central among them is that we could measure participation in the activity and the development and sharing of designs, but we could not measure changes in public awareness of AEDs, changes in AED use, or survival after cardiac arrest—3 outcomes of progressively greater meaning that motivated the study from the start. However, the purpose of this study was aimed more proximally: to test the possibility of engaging the public to design and evaluate the space around AEDs in a way that might be later deployed and tested as a way to improve survival after out-of-hospital arrest.

The Defibrillator Design Challenge facilitated crowdsourcing AED designs and themes that the public associates with AEDs. These designs were publicly posted on the project Web site so others who may be interested in implementation at actual sites of AEDs could easily view potential designs. The contest rules and process are also hosted online so others who may be interested in launching a similar contest could use the same framework. This approach could be expanded to other geographic locations and the crowdsourcing methodology used for other public health challenges. Future steps will involve development of an open-access toolkit about the projects' architecture with the aim of being highly collaborative so that AED designs from this contest, subsequent contests, and or other sources can be implemented in public locations to raise awareness. This project lays the groundwork for illuminating often hidden, yet life-saving public objects to potentially increase their usage when needed most. ■

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Human Participant Protection

This study was approved by the University of Pennsylvania institutional review board.

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