


Perspectives of emergency department attendees on outcomes of resuscitation efforts: origins and impact on cardiopulmonary resuscitation preference

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ABSTRACT

Background Previous studies have shown that individuals overestimate the success of cardiopulmonary resuscitation (CPR) while underestimating its morbidity. Although perceptions of CPR success affect medical care in the emergency department (ED), no ED-based studies have been done.

Objective To survey ED patients and their companions to assess their expectations, hypothesising that variation in information sources, prior exposure to CPR, and healthcare experience would influence predicted CPR success rates.

Methods A survey was carried out of adults (age >18 years) in the ED waiting area of a tertiary care hospital between June and September 2016. An optimism scale was created to reflect expected likelihood of survival after CPR, or CPR success, under several sets of circumstances. Potential predictors of optimism for CPR outcome were examined using linear regression. Associations between optimism and CPR preference were evaluated using a Wilcoxon rank-sum test.

Results There were 500 respondents and 53% had performed or witnessed CPR, and/or participated in a CPR course (64%). Television was the main source of information about CPR for >95% of respondents. At least half (51–64%) of respondents estimated the success rate of CPR as over 75% in all situations. Estimated CPR success rates were unrelated to age, sex, race, spiritual beliefs or personal healthcare experience. More than 90% of respondents wanted to receive CPR. Less than one-third of respondents had discussed CPR with a medical provider, but most wished to do so.

Conclusion Consistent with prior studies, individuals overestimate the success rate of CPR. Healthcare experience does not appear to mitigate optimism about CPR, and individuals overwhelmingly want CPR for themselves. Though few had talked about CPR with a medical provider, most wanted to have informed decision-making conversations. Such discussions could help patients obtain a more realistic view of CPR outcomes.

BACKGROUND

Emergency physicians are often the first providers to talk to patients or their families about end-of-life care and outcomes of resuscitation efforts. This may occur shortly after meeting them and/or during an acute emergency. In these stressful times, patient and family preconceptions of cardiopulmonary resuscitation (CPR) can have a significant effect

Key messages

What is already known on this subject

- Previous studies have shown that most lay people overestimate cardiopulmonary resuscitation (CPR) and underestimate its morbidity, potentially affecting decision-making and CPR preferences in the emergency department (ED).
- No prior studies have been conducted among patients and visitors in an ED.
- Understanding the views of ED patients and companions can help physicians deal with the preconceptions and preferences of these individuals in discussions about resuscitation in the emergent setting.

What this study adds

- In this survey of patients and visitors in a US ED, participants consistently overestimated the success of resuscitation. Opinions were not associated with previous training or involvement with CPR, education, gender, and healthcare-related experience. Participants overwhelmingly want physicians to discuss and educate them about CPR.
- These findings should prompt ED physicians to initiate discussions about resuscitation with their patients while also providing them with key information to help facilitate informed decision-making.

on the tone of the discussion and the subsequent medical care that is provided.

Previous studies have demonstrated that patients vastly overestimate the likelihood of a positive outcome of CPR while underestimating the morbidity associated with it.^{1–3} Many cite television, where rates of survival after CPR vary between 19% and 75%, as a main source of medical information.^{2–4} With rates of actual survival of CPR ranging from an average of 12% for out-of-hospital arrests to 24–40% for in-hospital arrests, there is an obvious disconnect between most media portrayals and real life.⁵ Cardiopulmonary resuscitation is a high-cost, morbid, and often unsuccessful endeavour. Inaccurate media portrayals of resuscitation are likely to lead to overoptimistic perceptions of CPR success. Many patients demonstrate a general lack of knowledge about the process,



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outcomes, and context of resuscitation while having some familiarity with general terms about it.⁶

Though standardised advanced directives are encouraged to help patients document their resuscitation preferences, few patients have completed them. Additionally, it is rare that the directive is available during an emergency. In the absence of an advanced directive, physicians often attempt cardiopulmonary resuscitation for patients in cardiac arrest. During these high-stress situations, the emergency providers are simultaneously working with a patient's loved ones to understand their CPR preferences and make decisions about continued resuscitation. To facilitate an effective shared decision-making conversation, it is crucial that emergency providers appreciate the patient's and family's understanding of resuscitation. It is often assumed that individuals with healthcare experience have a better understanding of resuscitation outcomes and therefore are better able to participate in informed decision-making discussions. Yet, previous studies have shown that physicians and nurses who are exposed to fictional medical dramas may also be influenced by them and overestimate resuscitation outcomes and are therefore not immune to bias.²

This study was designed to learn how these individuals perceive the success of CPR and what factors affect their CPR preference. Understanding the views of emergency department (ED) patients and companions can help physicians to deal with the preconceptions and preferences of these individuals in discussions about resuscitation in the emergent setting.

Specifically, we sought to understand what proportion of our attendees want CPR, how accurate their estimates of effectiveness are, if preferences are related to perceptions of effectiveness or other characteristics, and what shapes estimates of effectiveness. We expected that many attendees have significant misconceptions and unrealistic optimism about resuscitation outcomes, which may affect treatment preferences. As provider biases may greatly influence discussions about CPR, we also assessed whether healthcare experience affected preference or perception of CPR success. We hypothesised that individuals with healthcare experience probably have more formal experience and education about CPR and will have more realistic views of CPR success than those without such experience.

METHODS

This was a prospective survey study performed at the University of California Davis Medical Centre (UCDMC), a level 1 adult and paediatric trauma and academic tertiary care hospital in the United States that services a variety of patients from all socioeconomic classes. The UCDMC ED receives about 80 000 patient visits a year. The study was reviewed and approved by the UC Davis institutional review board.

Participants

Inclusion criteria limited participation to (1) adults 18 years old or older and (2) adults able to complete the survey independently in English. People were excluded if they were (1) under the age of 18, (2) could not independently complete the survey because of disability, illness, or lack of English proficiency or (3) were prisoners.

Study procedures

Data were collected in the ED waiting room between June and September 2016. Questionnaires were distributed to eligible patients and accompanying family or other community members who presented to the ED between the hours of 8 am and 1 am

the following day. During the other hours of the day, research associates were not available to distribute surveys. During study hours, patients were informed by the triage staff that they could participate in the survey voluntarily, but their participation was not tracked. This was done to reinforce to patients that participation would not influence subsequent medical care. Questionnaire distribution was performed by an Emergency Medicine Research Associate Programme (EMRAP) associate who answered basic questions about the study but was instructed not to aid the participant in completing the questionnaire. Patients were instructed that participation was anonymous, voluntary and would not affect their subsequent medical care. No information related to the participant's ED visit was collected. Completed questionnaires were placed into a designated location in the waiting room by the participant. Based on 80 000 annual ED visits a year, the sample size required to give a 95% CI for proportion with width ± 5 percentage points was calculated to be 382. We sought a 20% larger recruitment to allow for incomplete, illegible or unusable questionnaires.

Survey instrument

As no survey tool had previously been developed to assess perception of CPR in the emergency setting, a new tool was created (online supplementary appendix 1). The survey was created by the research team using several texts related to survey-based research as resources. Additionally, other literature on perceptions of outcome of CPR was reviewed in an attempt to adapt questions that had been used in prior studies. We were unable to find any studies focusing on this same population but did find that many studies related to CPR perceptions used scenario-based surveys. The survey questionnaire was given a Flesch-Kincaid grade level of 5.1 using an online tool, meaning that the reading level is appropriate for the average fifth grader in the USA. No formal piloting was performed before distribution of the survey.⁷ The questionnaire asked about participants' sources of information about CPR, personal preference regarding CPR, religious beliefs, past encounters with medical resuscitation, training in a healthcare field and other scenario-based questions to discern participants' medical knowledge and personal resuscitation beliefs. A subject was considered to have CPR experience if the subject had personally performed or witnessed CPR being performed. Individuals were asked if they worked in the healthcare field as a clinician, currently or in the past. Examples were provided to individuals who are considered healthcare professionals and included physicians, nurses, healthcare technicians, emergency medical technicians, paramedics, certified nurse assistants, pharmacists and clinical researchers. If individuals answered yes to the question, they were considered to be self-identified healthcare providers or individuals with healthcare experience.

To ascertain whether perceptions of CPR success influenced preference for CPR, we summarised the four questions about success in a single 'optimism scale'. Before data analysis for this step, we first combined the two lowest categories for each question, representing estimated success rates of 'never' and '<25%', into a single category scored as 0, reflecting the most realistic view of true rates of CPR success out of hospital. The remaining categories were scored as 1, 2 or 3 for each question, and responses summed for the four questions to give a score from 0 (most pessimistic but also realistic) to 12 (most optimistic). This was done after the survey was completed but before data analysis, as these two categories are reflective of true rates of out of hospital survival after CPR.⁵

Table 1 Demographic characteristics of 484 survey participants, comparing patients with non-patients

Characteristics	Total (n=n ₁ +n ₂ =484)	Patients (n ₁ =212)	Non-patients (n ₂ =272)*	P value
Age group: range of median group	–	29–38	29–38	
Sex, %				0.0044
Women	67.4 (326)	59.9	73.2	
Men	31.8 (154)	38.7	26.4	
Unknown	0.8 (4)	1.4	0.4	
Race/ethnicity, %				0.3358
White non-Hispanic	35.5 (172)	34.5	36.3	
Hispanic/Latino	24.0 (116)	22.1	25.4	
Asian	7.0 (34)	5.3	8.5	
African-American	13.4 (65)	16.0	11.3	
Other or multiple	17.1 (83)	19.4	15.4	
Unknown	2.9 (14)	2.7	3.0	
Education, %				0.9982
High school or less	28.7 (139)	29.3	28.3	
Some college	32.2 (156)	31.6	32.7	
College graduate or more	36.6 (177)	35.9	37.2	
Unknown	2.5 (12)	3.2	1.8	
Healthcare professional, %				0.9863
Yes	15.1 (73)	17.4	17.3	
No	81.0 (392)	79.9	81.7	
Unknown	3.9 (19)	2.7	1.1	
Religious/spiritual, %				0.5452
Yes	77.3 (374)	78.3	76.4	
No	19.0 (92)	17.4	20.2	
Unknown	3.7 (18)	4.3	3.4	
Prior cardiopulmonary resuscitation experience (Q7, Q8, Q10)				0.4744
Prior experience, negative outcomes	57.9 (280)	59.9	56.2	
Prior experience, >1 positive outcome	42.1 (204)	40.1	43.8	
Optimism scale (0=rarely, 12=always succeed) (Q11+12+13+14)				–
Mean (SD)	5.2 (2.3)	6.0 (2.3)	5.5 (2.2)	

*An additional 16 participants did not specify whether they were patients.

Analysis

Statistical analysis began with descriptive summaries of responses to each question (frequencies, bar plots, percentages and 95% confidence intervals for estimated percentages). Responses of patients were compared with those of non-patients by χ^2 test or Fisher's exact test for categorical data when the sample size was small.

Potential predictors of the results of an individual's optimism score regarding outcome of CPR were examined using linear regression, and association between the optimism scale score and preference for CPR was tested using a Wilcoxon rank-sum test. We also examined whether prior participation in successful CPR led to more optimistic views. All analyses were carried out in R.⁸

RESULTS

Questionnaires were returned for 500 participants, of whom 212 were ED patients, 272 were non-patients, and 16 did not specify (table 1). All returned surveys were used in the subsequent analysis. Patients and non-patients were similar for age range (from 20s to over 70, median in 30s), race/ethnicity (about one-third white non-Hispanic, typical of the Sacramento metropolitan area), education (about one-third each with high school or less, some college, and college graduates). Three quarters of the non-patients were female, compared with 60% of patients ($p=0.004$). Seventeen per cent of respondents were currently or formerly in healthcare professions, and more than 75% reported

some religious or spiritual beliefs. For both patients and non-patients, television was the primary source of CPR-related information; 95% of patients and 97% of non-patients reported seeing CPR on television. As expected, respondents with healthcare experience were much more likely to have taken a course (95%) than those without experience (57%). Two-thirds (64%) of all respondents had participated in a course that included CPR, and 53% had either personally performed CPR or seen it performed in an emergency.

The mean optimism score was 6 for patients and non-patients (table 1) and identical for healthcare professionals. Fewer than 2% of respondents believed that the success rate might be 25% or less in all circumstances. Most respondents (51–64%) estimated the success rate of CPR at over 75% in all settings but question 13 (full recovery for out of hospital cardiac arrest who gets CPR), where only a third placed the success rate that high.

More than 90% of participants said that they would want to receive CPR, a finding that was consistent across all demographics for both patients and non-patients (table 2). The only exception was people aged 69 or older. In this group, just over 70% reported a preference for CPR. Among healthcare professionals, 94.6% of patients and 97.9% of visitors reported wanting CPR.

In regression models looking at possible predictors of optimism about CPR, no association was found with sex, race/ethnicity, education, religion/spirituality, exposure to CPR

Table 2 Percentage of patient and non-patient survey respondents who want cardiopulmonary resuscitation (CPR), by demographic characteristics.

Characteristic	Percentage who want CPR	
	Patients: Want CPR n=201/212 (94.8%)	Non-patients: Want CPR n=257/272 (94.5%)
Age group		
18–28	93.9	93.8
29–38	98.2	96.6
39–48	94.6	95.7
49–58	92.9	100.0
59–68	100.0	96.4
69–88	71.4	73.7
Unknown	100.0	0.0
Sex, %		
Women	93.7	96.0
Men	97.6	90.3
Unknown	66.7	100.0
Race, %		
White non-Hispanic	93.2	93.9
Hispanic/Latino	95.7	95.7
Asian	90.9	100.0
African-American	94.1	90.3
Other, multiple	100.0	95.2
Unknown	83.3	87.5
Education, %		
High school or less	96.8	94.8
Some college	95.5	98.9
College graduate or more	92.1	91.1
Unknown	100.0	80.0
Healthcare experience, %		
Yes	94.6	97.9
No	94.7	93.7
Unknown	100.0	100.0
Religious/spiritual, %		
Yes	94.0	94.7
No	97.3	92.7
Unknown	100.0	100.0
CPR experience (Q7+8+10), %		
Prior experience, negative outcomes	59.7 (120)	56.0 (144)
Prior experience, >1 positive outcome	40.3 (81)	44.0 (113)
Optimism scale (0=rarely, 12=always succeed) (Q11+12+13+14)		
Mean (SD)	5.9 (2.3)	5.5 (2.2)

classes, or status as a healthcare professional (table 3). Older patients appeared to be more likely to have lower optimism scores, but this did not meet statistical significance ($p=0.090$). More than 80% of participants were aware that CPR success declines with age.

There was also no relationship between CPR preference and optimism about CPR results. The mean level of optimism for those who wanted CPR was 5.74 and for those who did not was 5.91 (Wilcoxon rank-sum test, $p=0.458$).

Individuals who had had a successful CPR experience had a slightly, but not statistically significant, optimism score. Among 52 healthcare professionals with successful CPR experience, the mean optimism score was 5.56 (median 6); for 32 healthcare professionals without successful CPR experience, the mean

Table 3 Predictors of whether respondent wanted cardiopulmonary resuscitation (CPR; logistic regression)

Predictor	OR	95% CI
Sex_male	9.7×10^{-1}	0.34% to 2.80%
Race_hispanic	1.7	0.41% to 6.84%
Race_asian	1.7	0.20% to 14.25%
Race_african	4.4×10^{-1}	0.12% to 1.54%
Race_other	1.5×10^7	0.00 Inf
Race_mix	1.2	0.13% to 11.07%
Education_high school	1.2	0.12% to 12.32%
Education_some college	2.5	0.23% to 26.78%
Education_graduated college	7.2×10^{-1}	0.08% to 6.85%
Education_graduate school	5.8×10^{-1}	0.05% to 6.78%
Education_never	2.2×10^7	0.00 Inf
Religion_yes	6.5×10^{-1}	0.18% to 2.38%
Exposure to CPR classes (Q1 yes on two or more occasions)	1.0	0.33% to 3.07%
Exposure to CPR classes (Q1 no)	2.4	0.63% to 9.34%
Status as a healthcare professional_yes	3.2	0.64% to 15.75%

optimism score was 5.39 (median 5) (Wilcoxon rank-sum test, $p=0.724$) (figures 1–4)

Only 28% of respondents stated that a physician had discussed CPR preferences with them. Most participants (79%) believed that a physician should talk to them about their CPR.

DISCUSSION

Our survey of ED patients and accompanying adults found that most people believed CPR is likely to be successful in most cases. Patients and non-patient groups were similar across categories and had a median optimism score of 6 in both categories. This corresponds to an estimate by participants that, depending on the situation, some (about 50%) or most (more than 75%) people receiving CPR are likely to have a favourable outcome.

Our results are consistent with other studies demonstrating overestimation of CPR success by patients and physicians.^{9–12} This may be related to media exposure. Consistent with

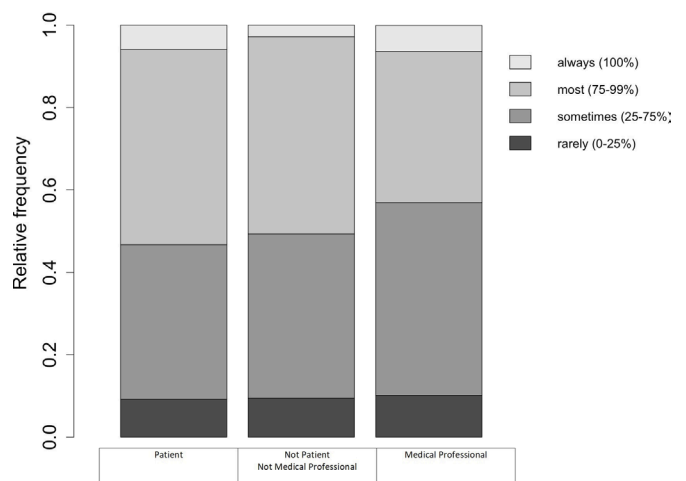


Figure 1 Predicted cardiopulmonary resuscitation (CPR) success by percentage chance of success for respondents in different categories corresponding to question 11: 'When a person's heart stops beating and they are NOT IN the hospital (for example, they are at home or at the grocery store), how often is CPR able to get their heart beating again?'

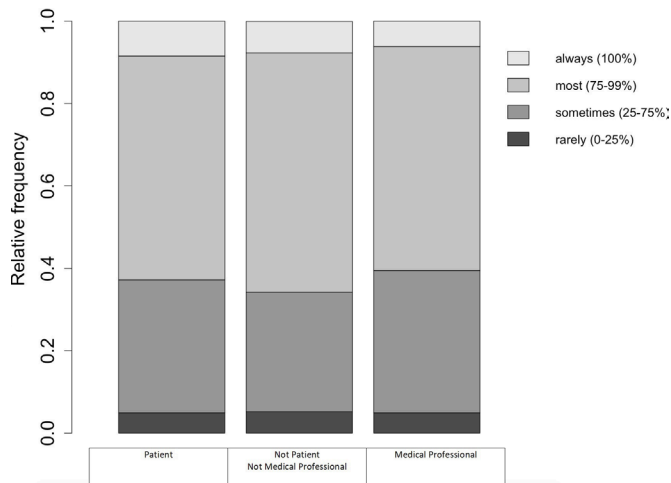


Figure 2 Predicted cardiopulmonary resuscitation (CPR) success by percentage chance of success for respondents in different categories corresponding to question 12: 'When a person's heart stops beating while they are IN the hospital (for example, an adult patient who is already sick and being treated by a medical team), how often is CPR able to get their heart beating again?'

previous reports, almost every respondent had been exposed to media portrayals of CPR. Inflated expectations of CPR success are likely to have a direct effect on a patient's expectation of personal survival and preference for CPR. In a previous survey of elderly patients who are the least likely to survive resuscitation, half believed their chances of survival to discharge to be more than 50%. More than a quarter of those surveyed believe that their chances were greater than 90%.⁹ In another study of elderly patients who were surveyed about their attitudes toward resuscitation, participants overestimated their personal survival to hospital discharge by nearly 300%. Personal CPR preferences can change when individuals are given accurate information. In one study, patients were surveyed about their CPR

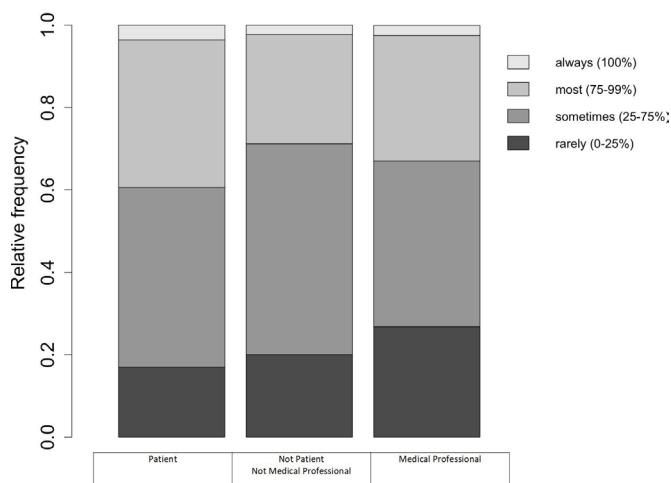


Figure 3 Predicted cardiopulmonary resuscitation (CPR) success by percentage chance of success for respondents corresponding to question 13: 'When someone's heart stops beating OUTSIDE of the hospital, such as at the grocery store, and they get CPR, how often do you think they recover and live the rest of their life as if nothing had happened? (This would NOT INCLUDE someone who has to be cared for at home because they cannot care for themselves.)'

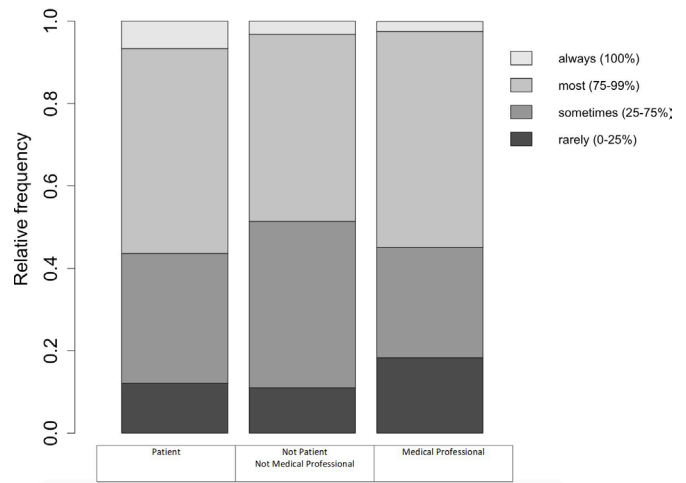


Figure 4 Predicted cardiopulmonary resuscitation (CPR) success by percentage chance of success for respondents in different categories corresponding to question 14: 'When someone's heart stops beating INSIDE of the hospital (for example, an adult patient who is already sick and being treated by a medical team), what percentage of the time do you think that they survive and will be able to live the way they did as if nothing had happened?'

preference and subsequently educated about their probability of true survival after CPR based on their age and comorbidities.⁹ In a follow-up survey, approximately half of the patients who initially opted for CPR no longer wanted CPR after learning about their true probability of survival.¹³ Previous studies have demonstrated that patients who are shown educational videos about cardiac resuscitation had more accurate estimations about CPR success afterwards, indicating that focused education about resuscitation outcomes can have an impact.¹⁴

A surprising 64% of respondents had participated in a course that included CPR, and most had performed CPR or seen it performed in an emergency. These numbers are much larger than had been expected and suggest that attendees in an ED are more experienced with resuscitation than the general population. However, personal experience with resuscitation, independent of healthcare experience, did not affect optimism scores. Our data showed respondents' optimism was not affected if they had taken a CPR course, or personally witnessed a resuscitation. This may be the result of a lack of emphasis on true rates of resuscitation success during formal healthcare training. Many individuals undergo standardised courses of basic life support or advanced life support, which focus on how to save a life or perform resuscitation manoeuvres, but these courses do not discuss rates of survival.¹⁵ American Red Cross CPR course materials do not discuss the success rates of in-hospital and out of hospital resuscitation, which may explain the lack of effect of CPR courses on the perceived effectiveness of CPR.¹⁶

We expected respondents without healthcare experience to be overly optimistic about rates of CPR but were surprised to find that even individuals with healthcare experience shared both an intention to ask for CPR and a belief in its effectiveness. Healthcare providers may subsequently overestimate the knowledge of individuals with healthcare experience, therefore omitting critical information about the rates of true CPR success, which would ultimately affect decision-making. Given the level of optimism seen among respondents with healthcare experience, it is possible that these providers probably overestimate CPR success

in individual cases, thereby introducing their own bias into shared decision-making conversations with patients.

Our results for optimism and healthcare experience differ from the results of Ouellette *et al*, in which respondents with a higher education level more accurately predicted rates of survival when posed with resuscitation scenarios.¹⁷ Our results may be explained by optimism bias, the concept that many individuals believe they are invulnerable and that negative outcomes are more likely to happen to others.¹⁸

Though only 28% of respondents had discussed CPR with a physician, most participants believed that a physician should talk to them about their CPR preference, highlighting a disconnect between patients and providers.¹¹

Strengths and limitations

As far as we are aware, no other study has specifically focused on emergency department attendees or, and in particular, those with healthcare experience. As healthcare providers facilitate resuscitation discussions with patients and families, it is important to understand their own misconceptions. The study took place at a single institution and a convenience sample of only English speakers was obtained limiting the generalisability of findings. Owing to limited work hours of research assistants, we were unable to actively distribute surveys between 1 am and 8 am. Though we received 500 completed surveys, we are unaware of how many people might have been eligible and were not approached or declined to respond. We did not track rates of survey completion for a few reasons. We did not want participants to believe that their subsequent medical care would be influenced by their participation and were concerned that those who chose not to participate might believe they would be penalised. Additionally, during the hours that EMRAP volunteers were not present, we did not expect the triage team, consisting of nurses and technicians, to assist with recording survey participation.

The survey was not formally piloted. Respondents were not helped during completion of the survey; any who did not fully understand the questions might not have responded accurately. Some respondents might have been distracted by illness or the emergency department waiting area environment. Though respondents with healthcare experience demonstrated similar rates of optimism as respondents without healthcare experience, we were not able to discern what type of healthcare experience respondents had, their particular role, or if different types of healthcare exposure had different effects on perceived CPR success. It is reasonable to assume that a provider specialising in resuscitation will have a different perspective than one without this type of experience. Further, this group was self-identified. We are not aware of any standardised and validated way to assess knowledge of CPR and outcomes. As respondents so uniformly wanted CPR, (over 90%), we have not explored whether their preference was related to overoptimism for any specific setting. Further investigation would be needed to examine perceived optimism in different types of scenarios.

CONCLUSION

Patients and visitors to an ED, regardless of prior healthcare or CPR experience, overestimate the likelihood of success with CPR. Emergency providers are often the only medical professionals with whom patients communicate, and these patients wish to take part in discussions about CPR. When discussing CPR preferences, ED providers should focus on true rates of survival

and outcomes in any shared decision-making conversation and should not assume that a patient or companion with healthcare experience will have realistic expectations. Given that individuals with healthcare experience also overestimate CPR success, it is imperative that providers also realise their own biases.

Contributors This manuscript reflects an original prospective survey-based research project undertaken at the University of California Davis Emergency Department in 2016. NSB and GW were the primary investigators and created the survey, obtained institutional review board approval and facilitated data collection. Data were reviewed, cleaned and analysed by LB and WH with oversight by NSB and GW. All authors contributed to revising and final creation of the manuscript.

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Competing interests None declared.

Patient consent for publication Not required.

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Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information. Additional deidentified and completed surveys are available if needed.

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REFERENCES

- Jones GK, Brewer KL, Garrison HG. Public expectations of survival following cardiopulmonary resuscitation. *Acad Emerg Med* 2000;7:48–53.
- Van den Bulck JJM. The impact of television fiction on public expectations of survival following in-hospital cardiopulmonary resuscitation by medical professionals. *Eur J Emerg Med* 2002;9:325–9.
- Marco CA, Larkin GL. Cardiopulmonary resuscitation: knowledge and opinions among the U.S. General public. state of the science-fiction. *Resuscitation* 2008;79:490–8.
- Diem SJ, Lantos JD, Tulsy JA, *et al*. Cardiopulmonary resuscitation on television. Miracles and misinformation. *N Engl J Med* 1996;334:1578–82.
- Meaney PA, Bobrow BJ, Mancini ME, *et al*. Cardiopulmonary resuscitation quality: improving cardiac resuscitation outcomes both inside and outside the hospital. *Circulation* 2013;128:417–35.
- Levinson M, Ho S, Mills A, *et al*. Language and understanding of cardiopulmonary resuscitation amongst an aged inpatient population. *Psychol Health Med* 2017;22:227–36.
- Readable App, 2018. Available: <https://app.readable.com/> [Accessed 4 May 2018].
- R Core Team. *R: a language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing, 2016. <http://www.R-project.org/>
- Adams DH, Snedden DP. How misconceptions among elderly patients regarding survival outcomes of inpatient cardiopulmonary resuscitation affect do-not-resuscitate orders. *J Am Osteopath Assoc* 2006;106:402–4.
- Kerridge IH, Pearson SA, Rolfe IE, *et al*. Impact of written information on knowledge and preferences for cardiopulmonary resuscitation. *Med J Aust* 1999;171:239–42.
- Miller DL, Jahnigen DW, Gorbien MJ, *et al*. Cardiopulmonary resuscitation: how useful? Attitudes and knowledge of an elderly population. *Arch Intern Med* 1992;152:578–82.
- Marco CA, Schears RM. Societal opinions regarding CPR. *Am J Emerg Med* 2002;20:207–11.
- Murphy DJ, Burrows D, Santilli S, *et al*. The influence of the probability of survival on patients' preferences regarding cardiopulmonary resuscitation. *N Engl J Med* 1994;330:545–9.
- Marco CA, Larkin GL. Public education regarding resuscitation: effects of a multimedia intervention. *Ann Emerg Med* 2003;42:256–60.
- Basic Life Support Training Manual. American Heart Association provider manual, 2016. Available: https://www.onlineaha.org/system/scidea/learning_resources/308/original/15-1010_BLS_ProviderManual_s.pdf [Accessed 29 Apr 2018].
- The American Red Cross. *American red cross first Aid/CPR/AED participants manual*. Staywell, 2011.
- Ouellette L, Puro A, Weatherhead J, *et al*. Public knowledge and perceptions about cardiopulmonary resuscitation (CPR): results of a multicenter survey. *Am J Emerg Med* 2018;36:1900–1.
- Taylor SE, Brown JD. Illusion and well-being: a social psychological perspective on mental health. *Psychol Bull* 1998;103:193–210.