Published in final edited form as:

J Crit Care. 2016 April ; 32: 85–88. doi:10.1016/j.jcrc.2015.11.015.

The Effect of Framing on Surrogate Optimism Bias: A Simulation Study

Dev Patel, MD*, Elan D. Cohen, MS[†], and Amber E. Barnato, MD, MPH, MS, FACPM^{†,‡,§}

*Department of Anesthesiology, University of Virginia, Charlottesville, VA

[†]Center for Research on Health Care, University of Pittsburgh, Pittsburgh, PA.

[‡]Division of General Internal Medicine, Department of Medicine, University of Pittsburgh, Pittsburgh, PA.

[§] Department of Health Policy and Management, Pitt Public Health, University of Pittsburgh, Pittsburgh, PA.

Abstract

Purpose—To explore the effect of emotion priming and physician communication behaviors on optimism bias.

Materials and Methods—We conducted a 5×2 between-subject randomized factorial experiment using a web-based interactive video designed to simulate a family meeting for a critically ill spouse/parent. Eligibility included age ≥ 35 and self-identifying as the surrogate for a spouse/parent. The primary outcome was the surrogate's election of code status. We defined optimism bias as the surrogate's estimate of prognosis with CPR $>$ their recollection of the physician's estimate.

Results—256/373 respondents (69%) logged-in and were randomized and 220 (86%) had non-missing data for prognosis. 67/220 (30%) overall, and 56/173 (32%) of those with an accurate recollection of the physician's estimate had optimism bias. Optimism bias correlated with choosing CPR ($p < .001$). Emotion priming ($p = .397$), physician attention to emotion ($p = .537$), and framing of CPR as the social norm ($p = .884$) did not affect optimism bias. Framing the decision as the patient's vs. the surrogate's (25% vs. 36%, $p = .066$) and describing the alternative to CPR as “allow natural death” instead of “do not resuscitate” (25% vs. 37%, $p = .035$) decreased optimism bias.

Conclusions—Framing of CPR choice during code status conversations may influence surrogates' optimism bias.

Corresponding author (reprints will not be ordered): Amber E. Barnato, MD, MPH, MS, 230 McKee Place, Suite 600; Phone: 412-692-4875, aeb2@pitt.edu..

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Disclosure: The authors have no financial conflicts of interest

Author contributions included: obtaining funding (AB), Conception and design (AB, DP), data collection (AB), data analysis (DP, EC, AB), manuscript drafting (DP, AB), critical review and revision of manuscript (EC). Dr. Barnato had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Keywords

intensive care; cardiopulmonary resuscitation; surrogate decision making; prognosis; optimism bias; acute lung injury; severe sepsis

Physicians ask relatives of incapacitated intensive care unit (ICU) patients to act as surrogates in the process of life-sustaining treatment decision making when prognosis for survival or functional recovery is poor. Unfortunately, surrogates often misinterpret or doubt physicians' prognostic estimates in these situations.¹⁻³ Specifically, they demonstrate "optimism bias" – predicting better outcomes than physicians – when presented with high mortality risk estimates, whereas they demonstrate concordant estimates when presented with low mortality risk estimates.³ This suggests that factors other than surrogate numeracy account for misinterpretation.⁴

The strong negative emotional states experience by surrogates, including fear, anxiety, and depression, in poor prognosis situations may play a role in optimism bias. Naturally occurring and experimentally-induced negative emotional states such as fear and anxiety are known to decrease risk perception.⁵⁻⁷ Physician communication behaviors designed to reduce such negative emotional states may, therefore, affect optimism bias.

The current study uses simulation to explore the effect of emotion priming and physician communication behaviors on optimism bias. We hypothesized that heightening attachment to the patient through emotion priming and framing decisions about cardiopulmonary resuscitation (CPR) in ways that increase emotional valence or culpability will increase optimism bias. Conversely, we expect that physician attention to emotion will decrease optimism bias.

MATERIALS AND METHODS

We conducted a cross-sectional between-subject randomized factorial experiment administered via the web, which has been previously described.⁸ The experiment asked the subject to consider the hypothetical situation in which their spouse or parent has been admitted to the intensive care unit and is receiving life-sustaining treatment for pneumonia, severe sepsis, and acute lung injury. During an interactive video meeting with a physician, played by an actor, the surrogate asks questions and receives information about the patient's medical condition, prognosis, and treatment plan. At the close of the meeting, the physician asks the surrogate about the patient's code status in the event of cardiac arrest.

Subjects

We recruited community participants 35 and older who self-identified as the surrogate decision maker for a spouse or parent using advertisements on buses, in hospitals and community centers in Pittsburgh, delivered to University of Pittsburgh and Carnegie Mellon University research registries, and posted under "community > volunteers" on Craig's list in 8 US cities (Pittsburgh, Boston, New York, Atlanta, Denver, Dallas, Los Angeles, and San Francisco). Eligible subjects included those who had a digital photo of their spouse or parent, access to the Internet, and English proficiency.

Experimental conditions

As described elsewhere⁸, the factorial design resulted in 32 permutations of the 5 experimental conditions (emotional priming (yes/no); physician emotion handling (yes/no); and CPR decision framing (CPR/no CPR as the typical (normative) decision; surrogate's/patient's decision; "Do Not Resuscitate (DNR)"/"Allow Natural Death (AND)" as CPR alternative). We embedded a randomization table into the web-based survey to assign 8 surrogates to each of the 32 combinations in equal blocks and we closed survey access after successfully randomizing 256 subjects.

Measures

After deciding code status, subjects completed a closed-ended survey, including a question about the physician's prognostic estimate for survival in event of cardiac arrest requiring CPR and a question about the surrogate's prognostic estimates. We defined optimism bias as a surrogate's estimate of survival greater (i.e., more optimistic) than their recollection of the physician's prognostic estimate. In a sensitivity analysis, we restricted analyses to surrogates whose recollection of the physician's estimate of survival to discharge after CPR was consistent with what the physician actually said (10%).

The primary independent variables were experimental assignment (emotion priming, physician attention to emotion, and the three CPR decision framing manipulations). Other covariates included characteristics of the surrogate (age, race, sex, religiosity, trust in the medical profession, prior experience with a relative in the ICU, and beliefs about the morality of withholding or withdrawing life-sustaining treatments) and their spouse/parent (age, surrogate assessed health status (excellent, very good, good, fair, poor), and hospitalization in the last year).

Statistical analyses

We explored surrogate and spouse/parent characteristics associated with optimism bias using the t-test or chi-square test, as appropriate. We tested the relationship between experimental condition and optimism bias using the chi-square test.

Human subjects and role of the sponsor

The University of Pittsburgh and Carnegie Mellon University institutional review boards reviewed and approved the research study as meeting exemption 2 for written informed consent. The National Institutes of Health, which funded the study, had no role in the design, execution, or analysis of the study or in the decision to seek publication.

RESULTS

Subjects

As previously reported, the web-based survey response rate was 69% and the completion rate was 98%.⁸

Of 256 respondents, 220 (86%) had non-missing data for both prognosis questions. There were no differences between item respondents and non-respondents with respect to age, sex,

race, ethnicity, or relationship to the person for whom they would be a surrogate decision maker. Of the 220 evaluable surrogates, 173 (79%) accurately recalled the physician's prognostic estimate. Sixty-seven (30%) of evaluable surrogates, and 56/173 (32%) of those with an accurate recollection of the physician's estimate, believed that their spouse/parent had better chances of survival than the physician estimated (i.e., optimism bias). Being an adult child vs. a spouse ($p=.04$), and making decisions on behalf of a younger ($p=.03$) and healthier ($p=.01$) patient were positively associated with optimism bias (Table 1). Optimism bias was strongly associated with the decision to choose CPR for their spouse/parent (79% vs. 46%, $p<.001$).

Relationships between experimental manipulations and optimism bias

Randomization to emotion priming ($p=.397$), physician attention to emotion ($p=.537$), and framing of CPR as the social norm ($p=.884$) did not influence optimism bias. Randomization to framing the CPR decision as the patient's instead of the surrogate's non-significantly decreased optimism bias (25% vs. 36%, $p=.066$), whereas describing the alternative to CPR as AND instead of DNR significantly decreased optimism bias (25% vs. 37%, $p=.035$). Optimism bias partially mediated the relationship between framing and CPR choice. Sensitivity analysis restricted to the 173 surrogates who accurately recalled the physician's CPR estimate did not qualitatively change these results, although the difference between the AND vs. DNR framing was no longer statistically significant (27% vs. 37%, $p=.17$).

DISCUSSION

In this web-based convenience sample of participants recruited from 8 US cities who self-identified as the surrogate for a spouse or parent, nearly one-third demonstrated optimism bias when faced with a hypothetical situation in which their family member was critically ill and the physician estimated a 10% chance of survival after CPR. Optimism bias was strongly associated with choosing CPR in the event of cardiac arrest. Optimism bias decreased when the physician framed the decision as the patient's, rather than the surrogate's, and when he described the alternative to CPR as “allow natural death” rather than “do not resuscitate.”

To the best of our knowledge, no prior study has measured the effect of framing on optimism bias. Prior studies of surrogate decision makers for critically ill patients have found that religious faith and perceptions of the patient's uniqueness, strength of character, and will to live to influence optimism bias and/or doubt in physicians' ability to prognosticate.⁴ Optimism bias underlies risky behavior.^{9,10} Surrogates appear less likely to trust risk assessment provided by physician in high risk situations.³ Basic science research suggests that optimism bias in the context of high risk situations may in part be mediated through the enhanced activation in the rostral anterior cingulate cortex and in the amygdala, regions of the brain involved in monitoring emotional salience.^{11,12} Physician behavior that increases surrogate's sense of risk and their culpability/responsibility may increase emotional salience and thereby increase optimism bias. Examples of such behavior include framing the decision as the surrogates rather than as the patient's (“do you want us to do CPR?” versus “would your mother want us to do CPR?”) and describing the alternative to

CPR as “do not resuscitate” rather than “allow natural death.” Indeed, our previously-reported finding that framing the alternative to CPR as “do not resuscitate” increased surrogates’ likelihood of choosing CPR may be mediated through optimism bias.⁸

Three other manipulations had no effect on optimism bias: emotional priming, physician attention to emotion statements, and framing CPR as the social norm. Our strategy to induce attachment increased surrogates’ depression-dejection scores⁸, and previous studies have shown a positive correlation between depressed state and pessimism (and non-depressed state and optimism)¹², but it is not known if more transient mood states influence optimism bias. The scripted attention to emotion statements by the physician may have been viewed as insincere, since they were not directly associated with surrogates’ expressions of emotion. Finally, although framing CPR as the social norm increased surrogate’s choice of CPR⁸, this effect was apparently not mediated by optimism bias.

Not surprisingly, we also found that a patient’s younger age and better health status were associated with optimism bias. These factors may result in surrogates’ belief that the physicians’ prognostic estimates do not apply to their relative, based upon a perception that their relative is healthier than an “average” patient and therefore has a more favorable prognosis.

Our study has several strengths and limitations. It is the first study to experimentally test the role of physician communication behaviors on surrogates’ optimism bias. On the one hand, our study has greater ecologic validity than other studies using paper-and-pencil vignettes, on the other hand, the simulation is unlikely to reproduce the affective state of surrogates.¹³⁻²² Our non-random convenience sample introduced selection bias, which reduces the generalizability of our findings. Additionally, we did not measure religiosity with sufficient granularity to adequately adjust for this construct in the models, nor did we collect data on numeracy. Finally, the small sample size increases type II error rate.

In conclusion, physician word choice may influence optimism bias, which in turn affects CPR choice. Plausible cognitive mechanisms related to emotional salience and culpability may explain these observations. Given the strong association between optimism bias and the decision to choose CPR by the surrogates in this simulation, further research should explore the role of these communication factors in optimism bias and life-sustaining treatment decision making among samples of surrogates in practice.

ACKNOWLEDGMENTS

The authors thank Professor George Loewenstein for his contribution to obtaining funding, study design, Dr. Arnold for his contribution to study design, Jessica Papadoupoulous MPH for research assistance, Dr. Jeremy Kahn for his contribution to development and testing of the intensivist script, Tim Bragg, Layla Sian, and Jason Kojtek for development of the web-based instrument, and Marsh Professional Simulators for furnishing the actor.

Funding:

This work was supported by National Institute for Nursing Research (K18 NR012847) and National Center for Research Resources (UL1RR024153 and UL1TR000005)

REFERENCES

1. Zier LS, Burack JH, Micco G, et al. Doubt and belief in physicians' ability to prognosticate during critical illness: the perspective of surrogate decision makers. *Crit Care Med.* Aug; 2008 36(8):2341–2347. [PubMed: 18596630]
2. Zier LS, Burack JH, Micco G, Chipman AK, Frank JA, White DB. Surrogate decision makers' responses to physicians' predictions of medical futility. *Chest.* Jul; 2009 136(1):110–117. [PubMed: 19318665]
3. Zier LS, Sottile PD, Hong SY, Weissfeld LA, White DB. Surrogate decision makers' interpretation of prognostic information: a mixed-methods study. *Ann Intern Med.* Mar 6; 2012 156(5):360–366. [PubMed: 22393131]
4. Boyd EA, Lo B, Evans LR, et al. "It's not just what the doctor tells me:" factors that influence surrogate decision-makers' perceptions of prognosis. *Crit Care Med.* May; 2010 38(5):1270–1275. [PubMed: 20228686]
5. Marx BP, Soler-Baillo JM. The relationships among risk recognition, autonomic and self-reported arousal, and posttraumatic stress symptomatology in acknowledged and unacknowledged victims of sexual assault. *Psychosomatic medicine.* Jul-Aug; 2005 67(4):618–624. [PubMed: 16046377]
6. Soler-Baillo JM, Marx BP, Sloan DM. The psychophysiological correlates of risk recognition among victims and non-victims of sexual assault. *Behaviour research and therapy.* Feb; 2005 43(2): 169–181. [PubMed: 15629748]
7. Wilson AE, Calhoun KS, Bernat JA. Risk recognition and trauma-related symptoms among sexually revictimized women. *Journal of consulting and clinical psychology.* Oct; 1999 67(5):705–710. [PubMed: 10535237]
8. Barnato AE, Arnold RM. The effect of emotion and physician communication behaviors on surrogates' life-sustaining treatment decisions: a randomized simulation experiment. *Crit Care Med.* Jul; 2013 41(7):1686–1691. [PubMed: 23660727]
9. Branstrom R, Kristjansson S, Ullen H. Risk perception, optimistic bias, and readiness to change sun related behaviour. *European journal of public health.* Oct; 2006 16(5):492–497. [PubMed: 16195355]
10. McKenna FP, Warburton DM, Winwood M. Exploring the limits of optimism: the case of smokers' decision making. *Br J Psychol.* Aug; 1993 84(Pt 3):389–394. [PubMed: 8401990]
11. Sharot T, Riccardi AM, Raio CM, Phelps EA. Neural mechanisms mediating optimism bias. *Nature.* Nov 1; 2007 450(7166):102–105. [PubMed: 17960136]
12. Sharot T. The optimism bias. *Current biology : CB.* Dec 6; 2011 21(23):R941–945. [PubMed: 22153158]
13. Azoulay E, Pochard F, Kentish-Barnes N, et al. Risk of post-traumatic stress symptoms in family members of intensive care unit patients. *Am J Respir Crit Care Med.* May 1; 2005 171(9):987–994. [PubMed: 15665319]
14. Jones C, Skirrow P, Griffiths RD, et al. Post-traumatic stress disorder-related symptoms in relatives of patients following intensive care. *Intensive Care Med.* Mar; 2004 30(3):456–460. [PubMed: 14767589]
15. Pochard F, Darmon M, Fassier T, et al. Symptoms of anxiety and depression in family members of intensive care unit patients before discharge or death. A prospective multicenter study. *J Crit Care.* Mar; 2005 20(1):90–96. [PubMed: 16015522]
16. Anderson WG, Arnold RM, Angus DC, Bryce CL. Passive decision-making preference is associated with anxiety and depression in relatives of patients in the intensive care unit. *J Crit Care.* Jun; 2009 24(2):249–254. [PubMed: 19327283]
17. Anderson WG, Arnold RM, Angus DC, Bryce CL. Posttraumatic stress and complicated grief in family members of patients in the intensive care unit. *J Gen Intern Med.* Nov; 2008 23(11):1871–1876. [PubMed: 18780129]
18. Kross EK, Engelberg RA, Gries CJ, Nielsen EL, Zatzick D, Curtis JR. ICU care associated with symptoms of depression and posttraumatic stress disorder among family members of patients who die in the ICU. *Chest.* Apr; 2010 139(4):795–801. [PubMed: 20829335]

19. Gries CJ, Engelberg RA, Kross EK, et al. Predictors of symptoms of posttraumatic stress and depression in family members after patient death in the ICU. *Chest*. Feb; 2010 137(2):280–287. [PubMed: 19762549]
20. Siegel MD, Hayes E, Vanderwerker LC, Loseth DB, Prigerson HG. Psychiatric illness in the next of kin of patients who die in the intensive care unit. *Crit Care Med*. Jun; 2008 36(6):1722–1728. [PubMed: 18520637]
21. Lautrette A, Darmon M, Megarbane B, et al. A communication strategy and brochure for relatives of patients dying in the ICU. *N Engl J Med*. Feb 1; 2007 356(5):469–478. [PubMed: 17267907]
22. Davidson JE, Jones C, Bienvenu OJ. Family response to critical illness: Postintensive care syndrome-family. *Crit Care Med*. 2012; 40(2)

Table 1

Surrogate and Patient (Relative) Characteristics, by Presence or Absence of Optimism Bias

Variable	Optimism Bias (n = 67)	No Optimism Bias (n = 153)	P-value
Surrogate Factors (n=220)			
Adult child of patient, n (%)	40 (60)	113 (74)	0.04
Spouse of patient, n (%)	27 (40)	40 (26)	
Age, mean (SD)	49.7 (1.6)	50.7 (1.0)	0.58
Male, n (%)	29 (43)	53 (35)	0.22
Female, n (%)	38 (57)	100 (65)	
White	54 (81)	117 (76)	0.21
Black	9 (13)	15 (10)	
Other	4 (6)	21 (14)	
Education			0.31
High school/GED	8 (12)	10 (6)	
Some college	17 (25)	32 (21)	
4-year college degree (Bachelor)	19 (28)	60 (39)	
Graduate degree	23 (34)	51 (33)	
Trust in medical profession, mean (SD)	15.0 (0.48)	14.1 (0.31)	0.11
Prior experience with a relative in the ICU, n (%)			0.65
Yes	53 (79.)	125 (82)	
No	14 (221)	28 (18.)	
Prior experience with a relative dying in the ICU, n (%)			0.36
Yes	19 (28)	53 (35)	
No	48 (72)	100 (65)	
Religiosity (Belief in God/spirit), n (%)			0.53
Yes	49 (73)	118 (77.)	
No	18 (27)	35 (23)	
Always immoral to withhold or withdraw LSTs	18 (27)	31 (20)	0.28
Not always immoral to withhold or withdraw LSTs	49 (73)	122 (80)	
Patient (spouse/parent) Factors (n=220)			
Age, mean (SD), y	66.1 (1.6)	71.3 (0.9)	0.03
Health status, n (%)			0.01
Excellent	9 (13)	9 (6)	
Very good	22 (33)	25 (16)	
Good	15 (22)	51 (33)	
Fair	14 (21)	48 (31)	

Variable	Optimism Bias (n = 67)	No Optimism Bias (n = 153)	P-value
Poor	7 (11)	20 (13)	
Hospitalized in last year, n (%)			0.57
Yes	24 (36)	61 (40)	
No	43 (64)	92 (60)	

Table 2

Optimism bias, by experimental condition

Experimental condition	Optimism Bias n/N (%)	P-value
Overall	67/220 (30)	
Unaroused, or “bold” emotional manipulation	37/112 (33)	.397
Aroused, or “hot” emotional manipulation	30/108 (28)	
MD does not attend to emotion	32/112 (29)	.537
MD attends to emotion	35/108 (32)	
MD frames CPR as the norm	34/110 (31)	.884
MD frames no CPR as the norm	33/110 (30)	
MD frames the CPR decision as the surrogate's	41/114 (36)	.066
MD frames the CPR decision as the patient's	26/106 (25)	
MD frames the alternative to CPR as “DNR”	41/111 (37)	.035
MD frames the alternative to CPR as “AND”	26/109 (24)	

MD – physician, DNR – do not resuscitate order, AND – allow natural death