

Randomized Controlled Trial of a Video Decision Support Tool for Cardiopulmonary Resuscitation Decision Making in Advanced Cancer

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ABSTRACT

Purpose

Decision making regarding cardiopulmonary resuscitation (CPR) is challenging. This study examined the effect of a video decision support tool on CPR preferences among patients with advanced cancer.

Patients and Methods

We performed a randomized controlled trial of 150 patients with advanced cancer from four oncology centers. Participants in the control arm ($n = 80$) listened to a verbal narrative describing CPR and the likelihood of successful resuscitation. Participants in the intervention arm ($n = 70$) listened to the identical narrative and viewed a 3-minute video depicting a patient on a ventilator and CPR being performed on a simulated patient. The primary outcome was participants' preference for or against CPR measured immediately after exposure to either modality. Secondary outcomes were participants' knowledge of CPR (score range of 0 to 4, with higher score indicating more knowledge) and comfort with video.

Results

The mean age of participants was 62 years (standard deviation, 11 years); 49% were women, 44% were African American or Latino, and 47% had lung or colon cancer. After the verbal narrative, in the control arm, 38 participants (48%) wanted CPR, 41 (51%) wanted no CPR, and one (1%) was uncertain. In contrast, in the intervention arm, 14 participants (20%) wanted CPR, 55 (79%) wanted no CPR, and 1 (1%) was uncertain (unadjusted odds ratio, 3.5; 95% CI, 1.7 to 7.2; $P < .001$). Mean knowledge scores were higher in the intervention arm than in the control arm (3.3 ± 1.0 v 2.6 ± 1.3 , respectively; $P < .001$), and 65 participants (93%) in the intervention arm were comfortable watching the video.

Conclusion

Participants with advanced cancer who viewed a video of CPR were less likely to opt for CPR than those who listened to a verbal narrative.

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INTRODUCTION

Informing patients about their choices at the end of life is an essential component of high-quality medical care.¹⁻⁴ However, end-of-life decision making can be challenging and emotionally charged. Physicians often do not effectively inform terminally ill patients about available medical procedures, including cardiopulmonary resuscitation (CPR). Patient comprehension may be hampered by common barriers to decision making, including the inability to realistically envision CPR, variability in the quality

of physician counseling, distortions portrayed in the lay media, anxiety about advance care planning, and low health literacy.⁵⁻⁹

Over the last two decades, various decision support tools, including videos, have been created to complement patient-clinician discussions and ensure that patients remain active participants in shared decision making.¹⁰⁻¹² These tools help patients make better decisions by providing standardized information regarding treatment options and clarifying benefits and risks of each choice.^{10,13,14} Videos have the potential to further enhance verbal

discussions by providing realistic visual images of treatment options and outcomes.¹³⁻¹⁵

Our group, the Video Images of Disease for Ethical Outcomes (VIDEO) Consortium, has developed and conducted evaluations of advance care planning video decision support tools for several conditions.^{16,17} One study involved a single-site, randomized trial of 50 patients with advanced brain cancer.¹⁷ We found that patients assigned the video were less likely to opt for CPR and were more informed about their decisions than those given verbal descriptions alone. This pilot work supports the potential efficacy of video support tools for advance care planning. However, to justify widespread implementation, further research is necessary to test their efficacy in a larger, more diverse sample of terminally ill patients with cancer from multiple institutions.

We conducted a randomized controlled trial to evaluate the effectiveness of a CPR video decision support tool among patients with different forms of advanced cancer being treated at oncology centers in different cities. We hypothesized that those viewing the video would be more likely to opt against attempted CPR compared with participants assigned to listen to only a verbal description of CPR. Secondary hypotheses were that participants who viewed the video would have greater knowledge of CPR, that their choices would endure over time, and that random assignment to the video and higher health literacy would be associated with a preference to forgo CPR.

PATIENTS AND METHODS

Setting

The study was performed at the following four outpatient oncology clinics: Boston Medical Center and Massachusetts General Hospital in Boston, Queens Hospital Cancer Center in New York City, and Vanderbilt-Ingram Cancer Center in Nashville. The institutional review board of each center approved the protocol, and all participants provided informed consent.

Study Sample

Consecutive participants were enrolled from April 16, 2009, to January 17, 2012. Eligible patients had to be English-speaking, return patients (ie, not a new consult), and patients with advanced cancer who were aware that the prognosis was less than 1 year as per the oncologist¹⁸ (Table 1). Potential participants were identified by the oncologist and research assistant (RA) by reviewing the medical charts of patients with clinic appointments. The RA was either a nurse or physician who underwent standardized training and used structured scripts to administer questionnaires and the verbal narrative of CPR.

On arrival in the clinic, potential participants were provided with a flyer describing the study. During the patients' appointments, their oncologists asked whether they wished to consider participation in the study. The RA met with interested patients after their appointment in a private room to verify eligibility and obtain informed consent. The RA then administered the baseline questionnaire, delivered the verbal narrative describing CPR, and randomly assigned participants to the control or intervention group. Participants in the intervention group were shown the video with the RA present, and all participants completed a postintervention questionnaire. Anyone accompanying the patient was invited to view the video, and the RA and oncologist were available to assess any adverse events.

Random assignments based on a computer-generated scheme were concealed in numbered envelopes and opened by the interviewer after participants heard the verbal description of CPR. Because of the nature of the study, the RA conducting all the in-person procedures at the clinic assessment could not be blinded to participant allocation. Another RA, who was blinded to the random assignment scheme, telephoned participants 6 to 8 weeks after the clinic assessment to reassess CPR preferences.

Table 1. Advanced Cancer Eligibility Criteria

Eligibility Criteria
All patients with the following:
Brain cancer
Inoperable hepatocellular/bile duct/gallbladder cancer
Incurable non-small-cell lung carcinoma
Extensive-stage small-cell lung cancer
Inoperable mesothelioma
Inoperable pancreatic cancer
Metastatic gastric cancer
Metastatic esophageal cancer
Metastatic melanoma
Patients with the following if first-line therapy has failed and limited response is expected to second-line therapy
Breast cancer
Colorectal cancer
Head and neck cancer
Leukemia
Ovarian cancer
Prostate cancer
Renal cancer
Sarcoma
Lung cancer
Myeloma
Lymphoma

Verbal Narrative

The verbal narrative describing CPR was read to each patient regardless of random assignment. A panel of clinicians with expertise in oncology (n = 15), critical care (n = 2), palliative care (n = 2), medical ethics (n = 2), health literacy (n = 1), and decision making (n = 1) drafted and edited the narrative in an iterative process. The description was based on a review of the literature and was written with language below an eighth grade reading level.¹⁹ The narrative states that "CPR attempts to get your heart to beat again if it stops" and outlines the process, risks, and likelihood of successful resuscitation in patients with advanced cancer (Appendix, online only).

Video Decision Support Tool

The 3-minute video included the same narrative as the verbal description that each participant heard. The development of the video followed a similar iterative process as that of the narrative and involved the same panel of experts. The video includes images of simulated chest compressions and intubation on a mannequin, as well as images of an actual ventilated patient receiving intravenous medicines. The visual scenes were filmed without the use of prompts or stage directions to convey a candid realism in the style known as *cinéma vérité*.^{20,21} All filming and editing were performed by the research team (A.E.V., M.K.P.-O., A.D.D., and E.D.A.) following previously published filming criteria.^{22,23} All patients (or their proxies) included in the video gave informed consent to be filmed, and no actors or special effects were used.

Data Collection and Outcomes

The primary outcome was participants' CPR preferences if their heart should stop beating while hospitalized as determined immediately after exposure to either the verbal narrative alone or the verbal narrative followed by the video. Responses were categorized as "Yes, attempt CPR," "No, do not attempt CPR," or "Not sure" (Appendix). CPR preferences were also ascertained during the baseline questionnaire at the initial clinical visit and at 6 to 8 weeks.

Additional baseline data included age, race, sex, educational status, marital status, having an advance directive (health care proxy or living will), and health status (excellent, very good, good, fair, or poor). Cancer type was determined from the participant's chart.

Knowledge about CPR was a secondary outcome and was assessed using three true or false questions and one multiple-choice question, each worth one

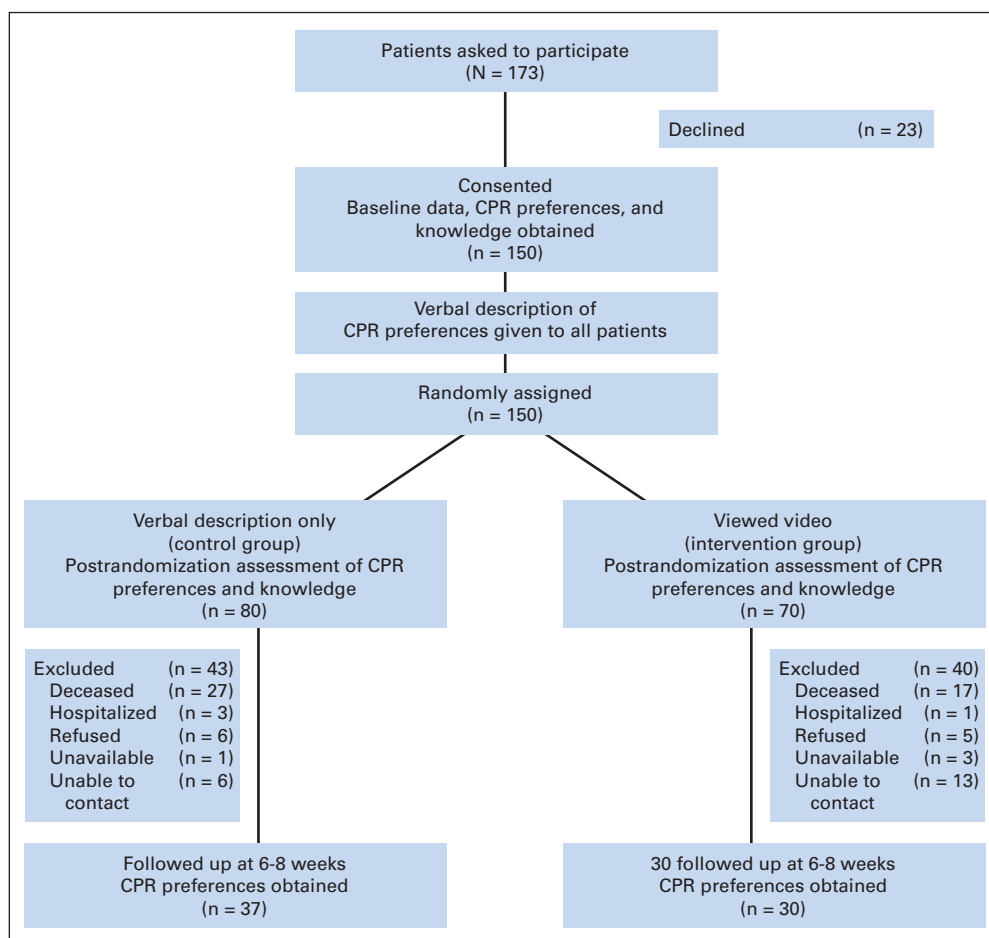


Fig 1. Study flow diagram. CPR, cardio-pulmonary resuscitation.

point (Cronbach's α coefficient = 0.68). Knowledge scores ranged from 0 to 4; higher scores reflect greater knowledge. All questions were used in previous studies (Appendix).¹⁷ Knowledge scores were ascertained from the baseline and post-random assignment questionnaires at the clinic assessment.

Health literacy was measured after random assignment using the Rapid Estimate of Adult Literacy in Medicine tool.²⁴ This 2- to 3-minute assessment of medically relevant vocabulary has been validated and correlates well with other measures of literacy. Participants were categorized as \leq sixth grade, seventh to eighth grade, or \geq ninth grade.^{25,26}

Participants in the intervention arm were asked about their perceptions of the video (very, somewhat, a little, or not helpful), their comfort watching the images (very, somewhat, or not comfortable or don't know), and whether they would recommend the tool to other patients (definitely, probably, probably not, or definitely not recommend).

Statistical Analysis

Participant characteristics and outcomes were described using proportions for categorical variables and means and standard deviations (SDs) for continuous variables. The primary outcome was participants' CPR preferences as ascertained at the postintervention questionnaire. Preferences were compared between the participants in the intervention arm and participants in the control arm using Pearson's χ^2 test with exact *P* values.

Secondary outcomes included knowledge about CPR and CPR preferences 6 to 8 weeks after the clinic visit (control *v* intervention). Cochran-Mantel-Haenszel tests were used to compare participants' knowledge scores and change in knowledge scores from baseline to postintervention questionnaires between the two groups.

Bivariate analyses were conducted to determine the association between individual participant characteristics (age, sex, race, education, mar-

ital status, advance directive, health status, health literacy, and random assignment group) and preference against CPR using the Pearson exact tests. Factors associated with this outcome at *P* < .10 in the bivariate analyses were entered into multivariable logistic regression models to identify factors independently associated with preferences against CPR. Participants uncertain about their preferences were combined with those who preferred to have CPR in this analysis, because both groups would generally get CPR. Odds ratios (ORs) and 95% CIs were derived from these analyses.

All reported *P* values are two-sided; *P* < .05 was considered statistically significant. The study was designed to detect a 31% relative difference in the proportion of participants choosing to forgo CPR between the two groups assuming the rate was 59% in the verbal group and 84% in the video group. With a target of 150 total patients, the power of the study was estimated to be 90%. Data were analyzed using SAS software, version 9.3 (SAS Institute, Cary, NC).

RESULTS

Participant Flow and Baseline Characteristics

A total of 173 eligible patients were approached to participate, and 150 (87%) were enrolled (Fig 1). Of the 150 enrolled participants, 80 were randomly assigned to the verbal control group and 70 were assigned to the video intervention group. Table 2 lists the demographic and clinical characteristics of the two groups.

Table 2. Demographics and Clinical Characteristics of Participants Randomly Assigned to the Verbal and Video Groups

Characteristic	Verbal Group (n = 80)		Video Group (n = 70)	
	No. of Patients	%	No. of Patients	%
Age, years				
Mean	62		63	
Standard deviation	10		13	
Women	40	50	34	49
Race				
American Indian/Native American	2	3	0	0
Asian	6	8	3	4
Black or African American	24	30	27	39
Hispanic or Latino	6	8	9	13
Other	0	0	2	3
White (non-Latino)	42	53	29	41
Education				
Elementary	8	10	6	9
Some high school	15	19	8	11
High school graduate	21	26	25	36
Some college	15	19	17	24
College graduate	13	16	7	10
Postgraduate or professional	8	10	7	10
Marital status				
Married or with partner	42	53	36	51
Widowed	10	13	7	10
Divorced	15	19	11	16
Single	13	16	16	23
Self-reported health status				
Excellent	5	6	4	6
Very good	12	15	11	16
Good	28	35	25	36
Fair	29	36	23	33
Poor	6	8	7	10
Type of cancer*				
Breast	11	14	6	9
Colon	18	23	17	24
Lung	21	26	14	20
Liver	6	8	4	6
Prostate	3	4	5	7
Head and neck	4	5	2	3
Other	17	20	20	29
Have an advance directive†	44	55	33	47

*Data are missing for two participants in video group.
 †Participants were asked if they had an advance directive, either a living will or health care proxy. One participant in the video group did not answer the question.

Preferences for CPR

Figure 2 shows baseline CPR preferences between the two groups before random assignment. In the postintervention questionnaire, CPR preferences differed significantly between the two groups. Of the 80 control participants, 38 (48%) preferred to have CPR attempted, 41 (51%) desired not to have CPR attempted, and one (1%) was uncertain. Of the 70 intervention participants, 14 (20%) preferred to have CPR attempted, 55 (79%) desired not to have CPR attempted, and one (1%) was uncertain ($P < .001$; unadjusted OR, 3.5; 95% CI, 1.7 to 7.2; $P < .001$).

A total of 37 control participants (46%) and 30 intervention participants (43%) were reached for the follow-up telephone inter-

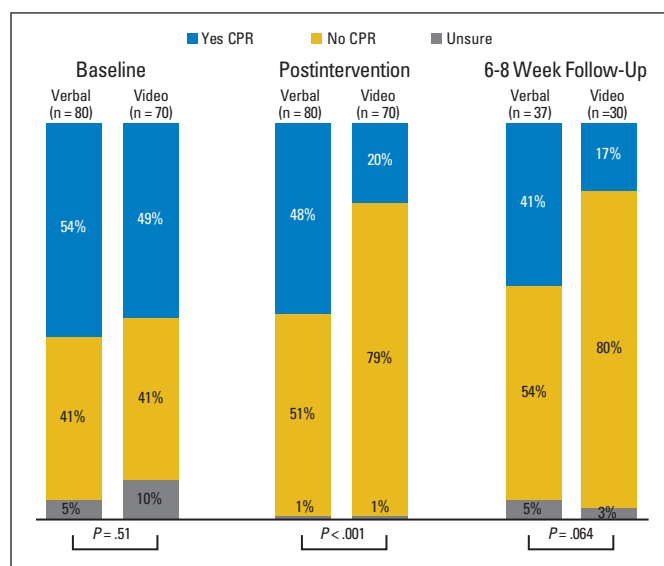


Fig 2. Cardiopulmonary resuscitation (CPR) preferences at baseline, after intervention, and at 6 to 8 weeks of follow-up. Exact P values were calculated using Pearson's χ^2 tests.

view. Death was the most common reason for the inability to complete the follow-up interview in both groups (Fig 1). Among participants contacted in the control group, 15 (41%) wanted CPR attempted, 20 (54%) opted to forgo CPR, and two (5%) were uncertain. Among participants contacted in the intervention group, five (17%) wanted CPR attempted, 24 (80%) did not want CPR, and one (3%) was uncertain (Fig 2; $P = .06$).

Knowledge

There were no statistically significant differences in baseline knowledge scores (range, 0 to 4) between the control and intervention groups before random assignment (mean score, 2.1 ± 1.2 v 2.0 ± 1.3 , respectively; median score, 2 v 2, respectively; $P = .9$). However, postintervention knowledge scores differed significantly (control group: mean score, 2.6 ± 1.3 ; median score, 3; intervention group: mean score, 3.3 ± 1.0 ; median score, 4; $P < .001$). The mean increase in postintervention knowledge scores was 0.6 (95% CI, 0.3 to 0.8) for the control group and 1.3 (95% CI, 1.0 to 1.6) for the intervention group.

Predictors of CPR Preferences

In the bivariate analyses, participant characteristics associated with a greater likelihood to forgo CPR at the $P < .10$ level, as ascertained in the postintervention questionnaire, were female sex (OR, 0.5; 95% CI, 0.3 to 1.02), white race (OR, 2.2; 95% CI, 1.09 to 4.3), random assignment to the intervention arm (OR, 3.5; 95% CI, 1.7 to 7.2), and higher health literacy (seventh to eighth grade v \leq sixth grade: OR, 3.4; 95% CI, 1.2 to 10.2; \geq ninth grade v \leq sixth grade: OR, 4.2; 95% CI, 1.9 to 9.4; Table 3).

After including these variables in a multivariable logistic regression model, random assignment to the intervention group (adjusted OR [aOR], 4.7; 95% CI, 2.1 to 10.7) and higher health literacy level (seventh to eighth grade v \leq sixth grade: aOR, 3.6; 95% CI, 1.1 to 12.0; \geq ninth grade v \leq sixth grade: aOR, 3.8; 95% CI, 1.3 to 10.8) remained independently associated with a preference to forgo CPR.

Table 3. Predictors of Postintervention Preferences Against CPR

Characteristic	Participants Choosing Against CPR		Unadjusted <i>P</i> *	OR			
	No.	%		Unadjusted OR	95% CI	Adjusted OR†	95% CI
Age, years							
< 60	36	59		Reference			
≥ 60	60	67	.30	1.4	0.7 to 2.8		
Sex							
Female	53	72		Reference		Reference	
Male	43	57	.063	0.5	0.3 to 1.02	2.0	0.9 to 4.3
Race							
Nonwhite	44	56		Reference		Reference	
White (non-Latino)	52	73	.028	2.2	1.09 to 4.3	1.5	0.6 to 4.0
Education							
< College graduate	70	61		Reference			
≥ College graduate	26	74	.16	1.9	0.8 to 4.3		
Marital status							
Not married or with partner	45	63		Reference			
Married or with partner	51	65	.74	1.1	0.6 to 2.2		
Health status‡							
Fair or poor	45	69		Reference			
Good or better	51	60	.30	0.7	0.3 to 1.3		
Advance directive							
None	43	60		Reference			
Living will/health care proxy	53	69	.30	1.5	0.8 to 2.9		
Intervention							
Verbal	41	51		Reference		Reference	
Video	55	79	< .001	3.5	1.7 to 7.2	4.7	2.1 to 10.7
Health literacy (REALM)§							
≤ Sixth grade (0-45)	16	40		Reference		Reference	
Seventh to eighth grades (46-60)	16	70	.036	3.4	1.2 to 10.2	3.6	1.1 to 12.0
≥ Ninth grade (61-66)	62	74	< .001	4.2	1.9 to 9.4	3.8	1.3 to 10.8

Abbreviations: CPR, cardiopulmonary resuscitation; OR, odds ratio; REALM, Rapid Estimate of Adult Literacy in Medicine.
 *All reported *P* values are two-sided, with *P* < .05 considered as statistically significant.
 †For the multivariable analysis, characteristics were excluded if they were not related to the outcome (*P* ≥ .10), choosing against CPR.
 ‡Health status was one of the following: excellent, very good, good, fair, or poor.
 §Health literacy was assessed with REALM. Three participants had missing data.

Experience With Video

Among the 70 participants in the intervention arm, 51 (73%) found the video to be “very helpful” and 12 (17%) found the video to be “somewhat helpful.” Similarly, 51 participants (73%) were “very comfortable” watching the video and 14 (20%) were “somewhat comfortable.” When asked whether they would recommend the video to other patients, 54 participants (77%) would “definitely recommend,” 14 (20%) would “probably recommend,” and no one would “not recommend” the video. There were no adverse events (eg, emotional distress) in either arm of the study.

DISCUSSION

This study presents an innovative video approach to decision making for patients with advanced cancer. Patients assigned to view a video were less likely to wish for attempted CPR compared with patients who only heard a verbal description of the intervention. Patients who viewed the video also had more accurate knowledge about CPR, and the vast majority were comfortable viewing the visual images. The effect of the video was largely unchanged after controlling for a variety

of relevant patient features. In addition, we found that higher health literacy was independently associated with opting against CPR. Videos supplementing verbal discussions may play a significant role in helping patients make more informed treatment decisions at the end of life.

To the best of our knowledge, this study represents the only multisite randomized trial of a video decision support tool for end-of-life decision making among patients with advanced cancer conducted to date. Our prior study conducted in a small group of patients with advanced brain cancer showed similar findings, but the patients were from one site and had a single, relatively rare cancer. The current study extends and builds on this work by demonstrating the efficacy of the video in a randomized controlled trial among patients with diverse cancers from multiple centers.

An essential ingredient of end-of-life decision making is the patient's ability to comprehend and realistically imagine options for medical interventions along with the accompanying risks and benefits. Viewing a video may provide patients with details and information that are not necessarily communicated in verbal descriptions. With the proliferation of visual media, patients are increasingly accustomed

to obtaining vital information for decision making from visual images.^{27,28} The fact that many patients had higher knowledge scores after the video and were comfortable viewing the video bolsters the acceptance of multimedia tools to empower patients and enhance decision making.

An additional finding of our study is the role of health literacy in complex decision making. Our findings suggest that patients with low health literacy may particularly benefit from the use of appropriately designed decision tools to explain medical procedures, which is consistent with prior work,²⁹⁻³¹ including in the advance care planning context.¹⁶

Our study has limitations that warrant comment. First, the RAs collecting the primary outcome data were not blinded to the random assignment, which is difficult to achieve with a video intervention. Previous randomized trials of advance care planning were also not blinded for similar reasons.⁵⁻⁷ Consequently, to minimize any potential bias, we used scripted interviews and standardized training developed in our prior work. We did, however, measure health literacy after the intervention; some people feel shame as a result of measurement of health literacy, and we did not want this to influence people's experience of the intervention.³²

Second, our study included questions regarding patients' knowledge that were not tested for reliability and validation, and we did not explore other aspects of decision quality such as decisional conflict, regret, and anxiety regarding decision making. Whether or not the video impacted the overall quality of patients' decisions is an important area for future study.

Third, hearing the verbal description of CPR again in the video narration may have reinforced preferences and knowledge in the video group. However, if the support tool is adopted into practice, its intent would be to reinforce, not supplant, a verbal discussion with a clinician. Fourth, visual images can be manipulated to steer patients toward a particular decision. To avoid favoring a particular perspective, we extensively previewed the video images with experts and used published filming criteria. Fifth, many patients in both groups died before the 6- to 8-week follow-up interview, which may have limited our ability to detect a statistically significant difference at this time point, but also underscored the severity of their illness. Finally, we surveyed participants' treatment choices in the context of a research study and did not confirm actual care delivery.

Videos supplementing verbal discussions can improve understanding of medical interventions that are difficult to imagine using

words. More work needs to be done to standardize and implement these tools across a range of diseases.^{13,33} As society adapts to the informational power of visual images, clinicians and health care systems can also harness these tools to educate and empower patients. This trial suggests that videos are an important tool to enhance patients' decision making by making sure patients understand CPR and are able to express their preferences at the end of life.

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

Although all authors completed the disclosure declaration, the following author(s) and/or an author's immediate family member(s) indicated a financial or other interest that is relevant to the subject matter under consideration in this article. Certain relationships marked with a "U" are those for which no compensation was received; those relationships marked with a "C" were compensated. For a detailed description of the disclosure categories, or for more information about ASCO's conflict of interest policy, please refer to the Author Disclosure Declaration and the Disclosures of Potential Conflicts of Interest section in Information for Contributors.

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Final approval of manuscript: All authors

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