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Video Messaging to Increase Vascularized Composite Allograft Donation Willingness in United States Military Veterans

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Background. Expansion of vascularized composite allograft (VCA) transplantation depends on the public's willingness to donate VCA organs, including face, extremities, and genitourinary organs. This study evaluated the effectiveness of video messaging on VCA donation willingness in US military veterans, a key stakeholder in VCA transplantation. **Methods.** Participants (n=556) were randomized to 1 of 3 VCA video messaging interventions (informational, testimonial, or blended), a general (non-VCA) organ donation video message, or a control (nondonation) video message. Questionnaires were completed at pre- and postintervention and at 3-wk follow-up. **Results.** Veterans exposed to any VCA video messaging were more likely to express VCA donation willingness (69%, n=203/296) than those exposed to general donation messaging (53%, n=47 of 89; $P=0.006$) or No Donation Messaging (37%, n=36 of 97; $P<0.001$). A significantly higher proportion of participants who received Blended VCA Messaging were willing to be VCA donors, compared with the Informational VCA Messaging group (79% versus 61%, $P=0.006$). Each VCA messaging video resulted in a significant pre- to postintervention increase in the proportion of participants willing to donate their own face, hands, and legs ($P<0.03$). **Conclusions.** Brief educational videos focused on VCA transplantation can have a demonstrable and verifiable impact on rates of VCA donation willingness in veterans.

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INTRODUCTION

Many clinical, scientific, ethical, and regulatory advancements have been made in vascularized composite allograft (VCA) transplantation in recent years.¹⁻¹³ Expanding VCA transplantation depends on the public's willingness to donate VCA organs. Although VCA transplantation and donation attitudes are generally favorable, willingness to donate VCA organs lags behind that of more traditional solid organs.¹⁴⁻¹⁷ Identifying effective strategies for increasing VCA donation willingness is important to move the field forward.

Some beneficiaries of VCA transplantation are military veterans who sustained severe combat injuries. The US Department of Defense (DoD) has contributed substantially to the development, evaluation and funding of science to advance VCA technology, clinical practice, and outcomes for its service members and veterans.^{18,19} In a recent survey of 1517 military veterans, we found highly favorable attitudes toward VCA transplantation, although willingness to donate VCA organs was lower than that for traditional organs.²⁰ Also, VCA donation willingness differed by VCA organ type, with veterans more willing to donate extremities than the face or genitourinary organs. Importantly, most veterans reported no exposure to information about VCA transplantation or donation in the preceding year.

The aim of this study was to evaluate the effectiveness of video messaging on veterans' willingness to be a VCA

donor. Behavioral willingness, which is an individual's openness and willingness to engage in a certain behavior,²¹ is an important educational outcome because a formal action step for documenting one's VCA donation wishes (eg, joining a registry) does not exist in the United States.¹¹ In line with prior research on donation messaging and informed by the Elaboration Likelihood Model,^{22,23} we compared 3 distinct types of VCA video messaging—information, testimonial, and blended messaging—to assess for impact on VCA donation willingness, in comparison to general (non-VCA) organ donation and control (nondonation) video messaging. We examined 3 hypotheses:

Hypothesis 1: VCA messaging will yield higher VCA donation willingness rates than general organ donation and nondonation messaging.

Hypothesis 2: Blended VCA messaging will yield higher VCA donation willingness rates than Testimonial or Informational VCA Messaging alone.

Hypothesis 3: White race, registration as an organ donor, less healthcare system distrust, prior exposure to media messages about VCA transplantation, and video group assignment will be significant predictors of VCA donation willingness.

MATERIALS AND METHODS

Design Summary

This was a 5-group randomized, controlled, repeated-measures educational trial conducted online (www.Qualtrics.com) with US military veterans. Participants completed questionnaires assessing traditional organ and VCA donation willingness, engagement, and opinions at preintervention, immediately postintervention, and 3-wk follow-up. Postintervention VCA donation willingness was the primary outcome. Participants were paid in 2 installments (\$50 for completing preintervention assessment, video, postintervention assessment; \$25 for completing follow-up assessment).

Recruitment and Eligibility Criteria

A nonprobability, voluntary response sampling strategy was used to recruit participants from July 2020 to December 2020. An email explaining the study purpose was sent to Veteran Service Officers in veteran programs, the American Legion, and select nonprofit organizations serving veterans in New England. Eligibility criteria were US military veteran, ≥18 y old, and internet access. Transplant candidates and recipients, living donors, and those with an injury for which VCA transplantation might be considered were excluded. The Institutional Review Board at Beth Israel Deaconess Medical Center approved the study (no. 2020P-000517).

Randomization

Simple randomization occurred within Qualtrics immediately after completion of the preintervention assessment, such that each participant had a 20% chance of being assigned to one of the video groups described later.

Video Intervention: Donation Messaging

Formative research, under separate IRB-approved protocols, was undertaken to facilitate development and selection of video messaging strategies. First, a survey of veterans was done to assess VCA attitudes and to identify knowledge gaps.²⁰ Second, 6 focus groups of 43 veterans were held in 4

New England states to gather qualitative information about VCA donation and strategies for educating the veteran community. Using survey and focus group findings, we consulted with organ donation specialists, media messaging experts, and veterans to finalize videos for this study.

All videos (Table 1) were approximately 4 min in duration. The VCA videos featured veterans and reflected informational only, testimonial only, or blended messaging. An organ donation video without VCA messaging was included to assess whether raising awareness about organ donation generally triggers VCA donation willingness. A video unrelated to organ donation or health behavior was used to assess whether any observed effects in the primary outcome are simply because of completing study assessments and watching a video.

Intervention Uptake

Participants were asked at postintervention assessment to select the featured element of their video from a dropdown menu (eg, a male veteran who received a hand transplant) as a proxy measure to assess whether they watched it.

Assessments

Primary Outcome

The primary outcome was behavioral willingness to be a VCA donor at time of death at postintervention. Participants were informed that VCA organs include face, upper and lower limbs, and genitourinary organs, as well as larynx, abdominal wall, and other body parts. They were told that traditional donor registration does not include VCA organs and then were asked to indicate their willingness to be a VCA donor at time of death (willing, unwilling, uncertain).

Secondary Outcomes

Preintervention, postintervention, and 3-wk follow-up assessments measured willingness to donate specific VCA organs for self and loved ones, interest in learning more about VCA transplantation, and opinions about VCA authorization.

Covariates

Covariates included sociodemographic characteristics (age, sex, race, ethnicity, marital status, education), military branch, healthcare system distrust,²⁴ transplant system trust,²⁰ donor registry status, and donation knowledge, attitudes, and beliefs.

Process Outcomes

Video likeability, presentation of facts, cognitive arousal, and emotional appeal were assessed postintervention.

Statistical Analysis

All data were analyzed using the Statistical Package for the Social Sciences (SPSS, Version 28; Chicago, IL). ANOVA or t tests (continuous variables) and chi-square or Fisher exact tests (categorical variables) were used for all group comparisons. Statistical significance was defined as $P < 0.05$, unless otherwise noted.

Before the primary outcome analysis, participants were classified as completers (primary outcome known) or non-completers (primary outcome unknown) and compared on all preintervention measures. Because completers and non-completers did not differ significantly on primary and secondary outcomes, it was assumed that missing data were missing

TABLE 1.
Video messaging type, description, and source

Video type	Description	Source
Informational VCA messaging (IM)	Features a male US Army veteran discussing 10 facts about VCA, including types of VCA transplantation, risks and benefits of VCA transplantation, and how VCA donation works; narration also describes why VCA transplantation is of high relevance to veterans with traumatic injuries; no personal testimonials about VCA transplantation	Video produced by research team; content provided by Health Resources & Services Administration (10 Things to Know About VCA Organ Transplants, https://www.organdonor.gov/sites/default/files/organ-donor/professional/materials/vca-fact-sheet-eng.pdf)
Testimonial VCA messaging (TM)	Features a male US Marine Corps veteran who received a double arm transplant following severe battlefield injuries; veteran describes his injuries and experience with VCA transplantation; no explicit statistics or facts about VCA transplantation or donation	Video produced by MilitaryKind, part of USA Today, which tells inspiring stories about active and retired military personnel; not edited by research team (https://www.youtube.com/watch?v=wcnoWH2BdY)
Blended VCA messaging (BM)	Features a male US Marine Corps veteran who received a double arm transplant following severe battlefield injuries; includes narration of same factual information about VCA transplantation included in IM video, but narrated by 2 VCA transplant surgeons	Video produced by Health Resources & Services Administration; not edited by research team (https://www.youtube.com/watch?v=JOVJmMSU18Y)
General donation messaging (GM)	Animated video quiz that provides facts about the donation process, the transplant waiting list, who can be an organ donor, and more	Video produced by Health Resources & Services Administration; not edited by research team (https://www.youtube.com/watch?v=M8vbBJOMN0&list=PL3AC309C7D7ECC392&index=12&t=6s)
No donation messaging (ND)	Narrated video featuring information and images of koala	Video produced by National Geographic (https://www.youtube.com/watch?v=ol3ADcDH0Uc)

VCA, vascularized composite allograft.

completely at random and a complete case analysis approach was used for the primary outcome analysis.²⁵ To facilitate data interpretation, the primary outcome was dichotomized (“willing” versus “unwilling or uncertain”).

To test Hypothesis 1, we combined participants in the 3 VCA groups (Informational + Testimonial + Blended) and we examined for primary outcome differences between the combined VCA messaging, general donation messaging, and No Donation Messaging groups. Next, we assessed the significance of any proportional change in VCA donation willingness from pre- to postintervention in each video group. Hypothesis 2 was tested by assessing for differences in the primary outcome between the Informational VCA Messaging, testimonial VCA messaging, and blended VCA messaging groups. For Hypothesis 3, simple logistic regression was used to examine associations between preintervention variables and the primary outcome. Participants with missing covariates were excluded from analysis. Variables associated ($P < 0.10$) with the primary outcome were included in a multivariable backward stepwise logistic regression model (odds ratio with 95% confidence interval). Variables that did not improve the model’s accuracy (ie, Wald chi-square $P > 0.05$) were eliminated. We then examined how interactions between video group and significant predictor variables affected the primary outcome using logistic regression models. Video group was entered in step 1, the significant predictor variable was entered in step 2, and the interaction term (video group \times predictor variable) was entered in step 3. If a significant interaction was found ($P < 0.05$), we identified the specific video groups to which the moderation effect applied by testing post hoc interactions with pairwise contrasts between the groups.

Secondary outcomes were examined for participants who completed all 3 assessments. Proportional changes from pre- to postintervention in willingness to donate specific VCA organs for self or others were assessed in each group. General linear model with repeated measures was used to assess for video group \times time interaction effect on interest in learning more about VCA. Significant effects ($P < 0.05$) were followed by post hoc comparisons. Finally, video groups were compared to assess for differences on process outcomes.

RESULTS

Enrollment and Sample Characteristics

Eight hundred seventy adults responded to the study invitation, 254 (29%) did not meet all eligibility criteria, and 60 (7%) met criteria but did not progress beyond eligibility questions, yielding a final sample of 556 veterans (Figure 1). A true response rate could not be calculated because of the recruitment strategies used; however, 90% of eligible respondents completed the preintervention assessment and were randomized to video group. Those who met eligibility criteria but did not initiate the preintervention assessment did not differ from study participants on sociodemographic characteristics ($P > 0.05$).

Table 2 shows sample characteristics by group. Overall, median age was 49 y (range 25–70) and most were male (77%), White (83%), married (64%), college educated (57%), and employed (67%). All military branches were represented. Most (65%) were registered donors. The study sample comprised a higher proportion of females and younger adults compared with the US veteran population.²⁶

A majority expressed support for VCA transplantation (hand/arm, 93%; leg, 92%; uterus, 81%; face, 76%; penis, 76%). Thirty-eight percent reported media exposure to VCA transplantation in the past year, most commonly for face (32%) and least commonly for uterus (7%) transplantation. About one-third (30%) were interested in learning more about VCA transplantation. More than half (53%) thought that VCA organs were included in organ donor registry enrollment, although 54% also felt that next-of-kin consent should be obtained for VCA donation even if the decedent was a registered donor. Most would donate VCA organs of a deceased family member who was a registered organ donor, but this varied by VCA type (hand/arm, 85%; leg, 85%; uterus, 73%; penis, 65%; face, 62%). Participants were evenly divided among those willing to be (36%), unwilling to be (32%), and uncertain about being (32%) a VCA donor. There were no video group differences in preintervention VCA donor willingness ($P = 0.99$).

Retention and Intervention Uptake

Overall, assessment completion rates were 87% ($n = 482$) at postintervention and 64% ($n = 356$) at 3-wk follow-up.

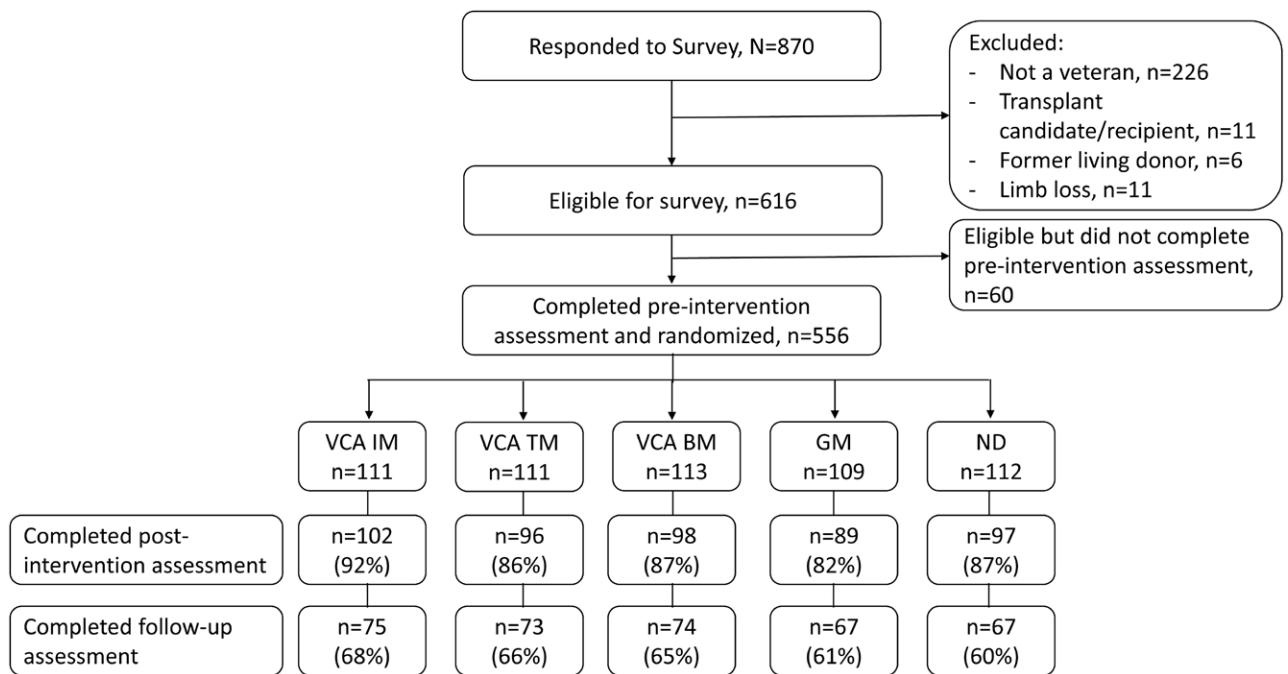


FIGURE 1. Study flowchart. BM, blended vascularized composite allograft messaging; GM, general donation messaging; IM, informational vascularized composite allograft messaging; ND, no donation messaging; TM, testimonial vascularized composite allograft messaging; VCA, vascularized composite allograft.

TABLE 2.
Preintervention sample characteristics (N = 556)

	Video intervention									
	VCA IM		VCA TM		VCA BM		GM		ND	
	(n = 111)		(n = 111)		(n = 113)		(n = 109)		(n = 112)	
Age, mean (SD), y	34.3	(12.4)	34.2	(12.4)	30.9	(12.6)	34.6	(12.3)	32.1	(12.7)
Sex, male	90	(81)	84	(76)	84	(74)	82	(75)	89	(79)
Race, White non-Hispanic	100	(90)	90	(81)	103	(91)	96	(88)	102	(91)
Married/partnered, yes	69	(62)	74	(67)	68	(60)	77	(71)	69	(62)
Education, college degree	62	(56)	63	(57)	63	(56)	63	(58)	67	(60)
Employed, yes	72	(65)	77	(68)	71	(63)	72	(66)	79	(71)
Military branch										
Air Force	18	(16)	23	(21)	21	(19)	23	(21)	22	(20)
Army	51	(46)	45	(41)	48	(43)	41	(38)	44	(39)
Marine Corps	18	(16)	17	(15)	22	(20)	20	(18)	25	(22)
Navy	21	(19)	20	(18)	13	(12)	18	(17)	17	(15)
Non-Defense	3	(3)	6	(5)	9	(8)	7	(6)	4	(4)
Healthcare system distrust, mean (SD)	23.5	(6.2)	24.7	(5.4)	25.5	(5.4)	24.9	(6.1)	24.7	(5.4)
Transplant system is fair, agree/strongly agree	79	(72)	83	(79)	85	(77)	83	(76)	76	(68)
Donation attitude, mean (SD)	3.5	(0.7)	3.5	(0.8)	3.5	(0.7)	3.5	(0.8)	3.5	(0.8)
Donation beliefs, mean (SD)	12.8	(1.8)	13.0	(1.8)	12.9	(1.8)	12.7	(1.9)	12.9	(1.8)
Donation knowledge, mean (SD)	2.7	(1.0)	2.8	(1.1)	2.7	(1.0)	2.7	(0.9)	2.6	(1.1)
Registered organ donor, yes	71	(64)	72	(65)	72	(64)	73	(67)	74	(66)
Know someone with limb loss, yes	27	(25)	41	(38)	41	(37)	32	(29)	35	(32)
General support for VCA transplant, yes	106	(96)	105	(96)	105	(94)	101	(94)	106	(96)
Any VCA media exposure in past y, yes	36	(32)	45	(42)	45	(40)	49	(45)	37	(33)
Interested in learning about VCA, very/somewhat	35	(32)	32	(29)	30	(27)	40	(37)	40	(36)

All fields are n (%) unless indicated otherwise.

No statistically significant group main effects ($P > 0.05$).

Donation attitude score ranges from 1 to 4; higher score = more favorable attitude.

Donation beliefs scores range from 4 to 16; higher scores = more favorable beliefs.

Donation knowledge scores range from 0 to 5; higher scores = more knowledge.

BM, blended vascularized composite allograft messaging; GM, general donation messaging; IM, informational vascularized composite allograft messaging; ND, no donation messaging; TM, testimonial vascularized composite allograft messaging; VCA, vascularized composite allograft.

Compared with those who completed all assessments, non-completers were less likely to have a college education (69% versus 58%, $P=0.01$) and less likely to be a registered donor (70% versus 54%, $P<0.001$). There were no differences in assessment completion rates based on video group assignment or pre-intervention primary and secondary outcome variables. Most (91%) correctly identified the core feature of their assigned video, and uptake rates did not differ by group ($P=0.97$).

Primary Outcome

Overall VCA Donation Willingness

Across all video groups, 59% of participants expressed behavioral willingness to be a VCA donor postintervention. There was a significant increase from pre- to postintervention in willingness to be a VCA donor in all donation video groups ($P<0.05$), but not in the No Donation Messaging group (Figure 2).

VCA Messaging Versus General Donation Messaging Versus No Donation Messaging (Hypothesis 1)

Participants exposed to any VCA messaging were more likely to express VCA donation willingness at postintervention (69%) than those exposed to General Donation Messaging (53%; $P=0.006$) or No Donation Messaging (37%; $P<0.001$). Participants receiving General Donation Messaging also had a higher rate of VCA donation willingness than those in the No Donation Messaging group ($P=0.03$).

Informational Versus Testimonial Versus Blended VCA Messaging (Hypothesis 2)

A higher proportion of participants who received Blended VCA Messaging were willing to be VCA donors, compared with the Informational VCA Messaging group (79% versus

61%, $P=0.006$). The Testimonial VCA Messaging group (67%) did not differ significantly from the Blended VCA Messaging (79%) or Informational VCA Messaging (61%) groups in VCA donation willingness. Only the Blended VCA Messaging group had a higher proportion of participants willing to be VCA donors than the General Donation Messaging group (79 versus 53%; $P<0.001$).

Predictors of VCA Donation Willingness (Hypothesis 3)

Eight variables predicted postintervention VCA donation willingness in the simple logistic regression models (Table 3). After controlling for preintervention VCA donation willingness, more favorable donation attitudes and assignment to one of the donation video groups were retained as significant predictors in the multivariable model (Table 3). This model was statistically significant ($P<0.001$) and explained 50% (Nagelkerke R^2) of the variance in VCA donation willingness.

Preintervention willingness to be a VCA donor was the only variable shown to moderate the effect of donation messaging on VCA donation willingness. To examine this moderation effect, we used chi-square tests to assess for intervention group differences in VCA donation willingness conversion and leakage rates. Conversion rates were defined as the proportion of participants who moved from preintervention “unwilling” or “uncertain” about being a VCA donor to “willing” to be a VCA donor postintervention. Leakage rates were defined as the proportion of participants who moved from preintervention “willing” to be a VCA donor to “unwilling” or “uncertain” postintervention. Blended VCA Messaging had a significantly higher conversion rate than all other groups ($P<0.02$) (Figure 3). Both the Informational VCA Messaging and Testimonial VCA Messaging groups yielded higher conversion rates than the General Donation Messaging group

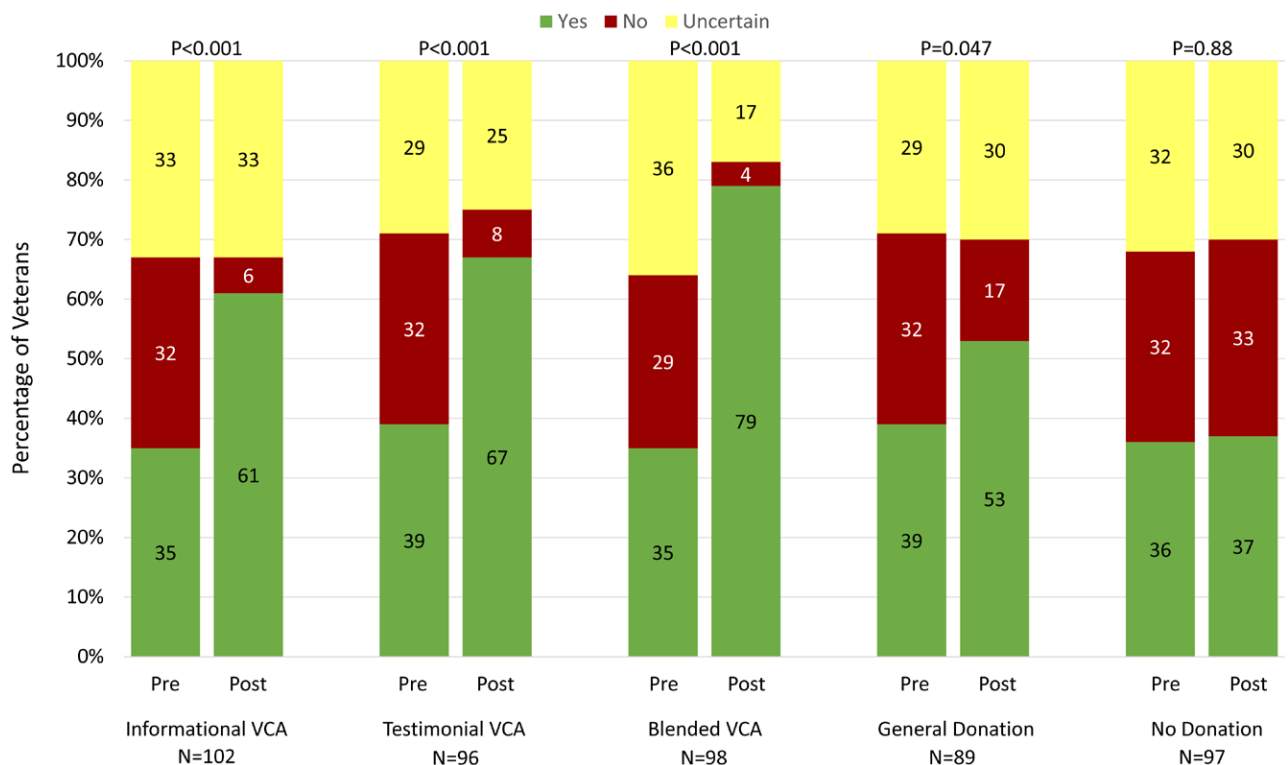


FIGURE 2. VCA donor registration willingness, unwillingness, and uncertainty, by video intervention group, among veterans who completed both pre- and postintervention assessments (n=482). VCA, vascularized composite allograft.

TABLE 3.
Effects of preintervention characteristics on VCA donor registration willingness postintervention: simple and multivariable logistic regression models

Simple logistic regression model		
Independent variables	VCA donor registration willingness	
	OR (95% CI)	P
Intervention^a		
Informational VCA messaging	2.63 (1.48-4.66)	<0.001
Testimonial VCA messaging	3.39 (1.88-6.12)	<0.001
Blended VCA messaging	6.21 (3.29-11.72)	<0.001
General donation messaging	1.90 (1.06-3.41)	0.03
Preintervention characteristics		
Willingness to be a VCA donor (pre)	12.38 (7.23-21.22)	<0.001
Age, y	0.99 (0.97-1.00)	0.13
Female	1.45 (0.93-2.26)	0.10
White	1.28 (0.81-2.03)	0.29
Married or partnered	1.16 (0.80-1.70)	0.43
College education	0.96 (0.67-1.39)	0.83
Employed	1.16 (0.79-1.70)	0.44
Know someone with limb loss	0.75 (0.51-1.11)	0.16
Healthcare system trust	1.00 (0.97-1.04)	0.91
Transplant system trust	2.17 (1.44-3.28)	<0.001
Donation attitude	3.03 (2.28-4.03)	<0.001
Donation beliefs	1.36 (1.22-1.52)	<0.001
Donation knowledge	0.85 (0.71-1.01)	0.07
Registered donor	2.64 (1.79-3.88)	<0.001
VCA transplant support	5.62 (2.05-15.41)	<0.001
Interest in learning about VCA	0.46 (0.31-0.69)	<0.001
VCA media exposure	1.62 (1.11-2.36)	0.01
Multivariable logistic regression model		
Predictors	VCA donor registration willingness	
	OR	P
Informational VCA messaging	4.38 (2.04-9.39)	<0.001
Testimonial VCA messaging	6.53 (2.91-14.66)	<0.001
Blended VCA messaging	14.04 (6.10-32.32)	<0.001
General donation messaging	2.75 (1.07-5.16)	0.03
Willingness to be a VCA donor (pre)	15.46 (8.23-29.02)	<0.001
Donation attitudes	2.74 (1.94-3.87)	<0.001
Logistic regression adjusted R²	0.50	

^aReference category = no donation messaging video group.

CI, confidence interval; OR, odds ratio; VCA, vascularized composite allograft.

($P=0.004$ and $P=0.01$, respectively). The conversion rates for the Informational VCA Messaging and Testimonial VCA Messaging groups were not significantly different. All donation video groups resulted in higher conversion rates than the No Donation Messaging group ($P<0.001$). The Informational VCA Messaging group had the highest leakage rate (22%) relative to all other groups (5% to 9%) (Figure 3).

Secondary Outcomes Specific VCA Organs

Each VCA messaging video resulted in a pre- to postintervention increase in willingness to donate their own face, hands, and legs ($P<0.03$). For both limbs (upper and lower), the proportional increases from pre- to postintervention were higher in the Blended VCA Messaging group (34% and 29%, respectively), and those gains were maintained through follow-up assessment. There were no changes over time in

the proportion of participants willing to donate their uterus (females only) or penis (males only) for any of the video groups ($P>0.05$).

There was an increase from pre- to postintervention in the proportion of participants willing to donate a loved one's face at time of death in the Informational VCA Messaging group ($P=0.03$). Pre- to postintervention increases also were observed for hand, leg, and uterus donation in the Testimonial VCA and Blended VCA messaging groups ($P<0.04$). Only in the Testimonial VCA Messaging group was there an increase in willingness to donate a loved one's uterus ($P=0.02$). General Donation Messaging and No Donation Messaging did not result in any increase in the proportion of participants willing to donate VCA organs on behalf of a deceased loved one.

VCA Engagement

There was a Group \times Time interaction effect for interest in learning more about VCA transplantation ($P<0.001$). Each donation video resulted in an increase in VCA engagement from pre- to postintervention, although Testimonial VCA and Blended VCA messaging groups had higher gains than both Informational VCA Messaging and General Donation Messaging groups. VCA engagement gains were maintained to 3-wk follow-up for participants in all 3 VCA messaging groups but not for those in the General Donation Messaging group. There was no change in VCA engagement over time for participants in the No Donation Messaging group.

Donor Registration Stability

Among those registered as organ donors, Blended VCA Messaging yielded a decline from pre- to postintervention in the proportion of participants who said they would be less likely to register as a donor in the future if VCA authorization was part of the registry (22% versus 6%, $P=0.02$). There were no significant changes in likely registry behavior over time in the other video groups.

VCA Authorization

There were no video group or time differences in the proportion of participants who felt that next-of-kin consent should be required for VCA donation, even if the deceased was a registered organ donor (preintervention, 51%; postintervention, 44%; follow-up, 48%).

Process Outcomes

There were group effects on whether the videos made participants think ($P=0.006$) and feel ($P<0.001$), and for overall likability ($P=0.02$). Compared with General Donation Messaging, participants who viewed Testimonial VCA Messaging and Blended VCA Messaging videos were more likely to say that the videos made them think and feel, and were more likable. Participants were more likely to report that watching the Testimonial VCA Messaging and Blended VCA Messaging videos made them feel, compared with participants who watched the Informational VCA Messaging video. There were no group effects on whether participants thought the video had good facts or featured nice people.

DISCUSSION

In this first randomized controlled organ donation education trial with military veterans, we found that video messaging is very effective at increasing behavioral willingness to

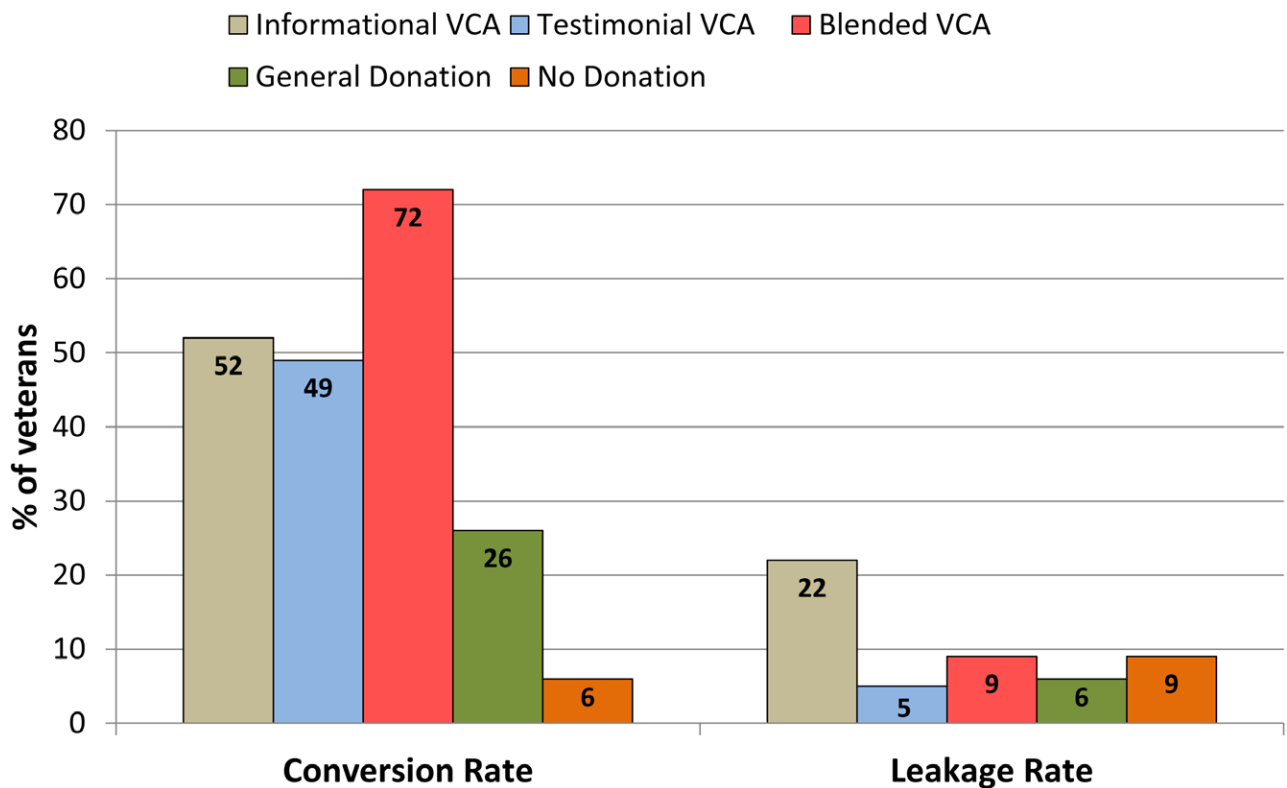


FIGURE 3. VCA donation willingness conversion and leakage rates by intervention group. VCA, vascularized composite allograft.

be a VCA donor at time of death. During the Global War on Terror, thousands of military personnel have lost limbs and suffered severe facial injuries, all with associated physical and psychological burden.^{19,27-30} Consequently, veterans and the DoD are key stakeholders in the advancement of VCA transplantation.¹⁹ Current study findings show that veterans are sympathetic to VCA transplantation, want to learn more about it, and are willing to be a VCA donor once exposed to its benefits for injured veterans and others. Indeed, veterans may have more favorable attitudes toward both traditional and VCA organ donation compared with the general population.^{14,20}

Video messaging is an effective and persuasive strategy for increasing favorable attitudes toward organ donation and donor registry enrollment.^{22,31-33} We extend these findings by showing that video messaging is also effective at increasing behavioral willingness to donate VCA organs. This mirrors findings by Plana et al³⁴ who also demonstrated that exposure to an informational video on face transplantation increased the willingness of adults to be face donors. Importantly, our data also show the essential role played by messaging type. Of the 3 VCA videos, messaging that blended factual information about VCA transplantation with a veteran's personal testimonial offered the strongest evidence for influencing VCA donation willingness in veterans. Blended messaging yielded a 144% increase in the absolute number of veterans willing to be a VCA donor and a 72% conversion rate, metrics far exceeding those of other messaging types. Empathy arousal is essential for activating the strongest attitude change,³⁵ and coupling emotional activation with basic information seems particularly effective for veterans who previously may not have considered VCA donation to be personally relevant.

Despite the overall effectiveness of the VCA-specific videos, one-fifth of veterans who initially expressed willingness to be a VCA donor changed their minds after watching the VCA informational video. Lafreniere et al¹⁶ evaluated an informational video on face and hand transplantation in Canada and found a similar leakage rate in willingness to be a face donor. Unfortunately, neither study asked participants why they altered their willingness to be a VCA donor. One possible explanation is that both videos attempted to engage participants through factual information only. The Elaboration Likelihood Model²³ postulates that factual information is persuasive for those individuals who already perceive the topic to be of moderate to high personal relevance. Indeed, most veterans in our study had not given much thought to VCA transplantation or donation so providing them with factual information in the absence of any type of empathy arousal may have caused some to more critically evaluate their prior commitment to VCA donation. It may be that some nominal leakage rate is inevitable when delivering educational interventions about VCA transplantation and donation. However, ensuring that factual information about VCA is paired with testimonial messaging may be one effective strategy to attenuate leakage rates. Qualitative research is needed that assesses why people became less favorable toward VCA donation after being presented with information about it, which would then inform strategy development to mitigate the risk of leakage. Nevertheless, given the leakage rates observed in these 2 studies, we recommend its measurement in future VCA educational trials.

Although general support for VCA transplantation and donation is moderately high, it lags behind that of traditional organs.^{14,17,20,34} Moreover, VCA donation appears to have the

same gap between transplantation support and donation willingness as that of traditional organ donation.^{17,20} Although increases in donor registry enrollment indicate that this gap is narrowing for traditional organ and tissue donation,³⁶ it has taken decades of coordinated public education, policy and legislative changes at the state level, and substantial levels of financial investment by federal agencies and organ procurement organizations to achieve these gains. The terrain to navigate in closing the VCA support-willingness gap is likely to be much more challenging. Unlike for traditional organs, VCA transplantation is uncommon and has garnered limited media exposure, VCA transplantation is performed in only a few regions of the country, VCA donation is a much lower probability event after death, no venues (eg, motor vehicle offices) periodically prompt consideration of VCA donation, VCA donation is made possible by next-of-kin consent only and not by first-person authorization, VCA donation willingness varies considerably based on organ type, there are few coordinated public education campaigns about VCA donation, not all organ procurement organizations have VCA donation programs, and financial investment in VCA public education has been negligible.

Our data suggest an appetite for more VCA information. One-third of veterans were interested in learning more about VCA transplantation at time of study enrollment, a rate that doubled after exposure to VCA-specific videos. However, a recent analysis highlighted core content deficiencies in existing VCA educational materials, and concluded that VCA education should be more comprehensive and balanced to enhance public understanding and trust.³⁷ Although the VCA-specific videos we used were effective, they did not include many of the content elements considered essential by Van Pilsum Rasmussen et al,³⁷ including featuring multiple VCA types, risks of VCA transplantation, long-term outcomes, and testimonials from donor families. More work is needed to develop educational materials that are inclusive of all relevant experiences and that comprehensively address the barriers to VCA donation.¹⁴

There are many notable strengths to this study, including use of formative research to guide study development, a randomized controlled trial design, repeated measures, and a comprehensive assessment strategy. However, we acknowledge several limitations. First, findings may be influenced by selection bias as veterans who responded to the study invitation may differ in characteristics from those who did not. Also, cognitive processes and environmental conditions (eg, distractions, interruptions, technical, or quality issues) may have contributed to self-report bias in responding to our hypothetical scenarios. Second, several VCA transplants have been performed in New England and veterans here may have had exposure to VCA media messages that they did not recall at the time of initial assessment, but which may have influenced perceptions. Third, the short time from pre- to postintervention assessments increases the likelihood of socially desirable responses and, therefore, this may have artificially inflated VCA donation willingness rates. Fourth, this online trial was conducted during the global COVID-19 pandemic, which may have impacted study outcomes in ways not assessed. Considering these limitations, replicating our findings before widespread adoption of seemingly effective video interventions is recommended.

Finally, the focus of this study was on military veterans, a population with an increased likelihood of catastrophic battlefield injury. Despite the DoD investment in VCA, limb loss and severe facial injuries for which VCA transplantation has clinical applicability are much more common in the general population.¹⁸ Consequently, we recognize the need for systematic efforts to educate the general public about VCA transplantation and donation. The videos used in this study, whereas featuring military personnel, may be useful in raising awareness and willingness to donate VCA organs in the general public. Future research should evaluate the impact of these videos more broadly in the general population, perhaps using crowdsourcing platforms (eg, Amazon Mechanical Turk) since we found it very efficient to deliver them electronically.

In conclusion, findings from this innovative study suggest that brief educational videos focused on VCA transplantation can have a demonstrable impact on rates of VCA donation willingness in veterans. Moreover, data showed that success of video-based education varies based on the type of message appeal, with video messaging that blends factual information with testimonials being most effective. Importantly, VCA donation willingness was not associated with sociodemographic characteristics, suggesting that video interventions may have broad applicability in the veteran population. Therefore, further evaluation and dissemination of VCA messaging appeals to the larger veteran population are recommended. Veteran Service Officers and veteran-focused nonprofit organizations were receptive to helping educate veterans about organ transplantation and donation. Delivering video interventions online with their engagement proved feasible, efficient, and cost-effective, offering a potential modality for delivering VCA education to the US military veterans across the country.

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