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Using video education to improve outcomes in heart failure

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ABSTRACT

Background: Heart Failure (HF) guidelines recommend HF self-care education. An optimal method of educating HF patients does not currently exist.
Objectives: To evaluate the effectiveness of supplementing usual HF education with video education and evaluate patients' satisfaction with video education.
Methods: A mixed methods design was used. A convenience sample of 70 patients was recruited from an academic medical center. Participants completed the Atlanta Heart Failure Knowledge Test and the Self-care of Heart Failure Index before and after receiving video education, to measure HF knowledge, self-efficacy, and self-care respectively. Video usage and satisfaction with video education data were collected. All-cause 30-day readmissions data were compared to a historical group.
Results: HF knowledge and self-care maintenance scores increased significantly. Self-efficacy, self-care management and all-cause 30-day readmissions did not significantly improve. Most HF patients were highly satisfied.
Conclusion: Supplementing usual HF education with VE was associated with improved HF knowledge and self-care maintenance.

Introduction

An estimated 6.5 million US adults aged 20 years and older have heart failure (HF).[1] In high-income countries, HF is the most common diagnosis for hospital admission in patients 65 years and older.[2] An estimated one million hospitalizations in the U. S. in 2010 were for HF, a rate unchanged from 2000.[3] The increasingly high social and financial burden of HF has led to close monitoring of HF readmissions by the Centers for Medicare & Medicaid Services (CMS) and public notification of 30-day readmission rates as part of the Hospital Compare program.[4] Additionally, CMS reduces Medicare payments to hospitals for readmission rates above the set standard, with the maximum penalty in 2015 set at 3%.[5] As of 2015, the HF readmission rate at our project site was 22.7%, compared to the national average of 21.9%.[6] To improve HF outcomes and reduce hospitalizations, educating patients about HF and self-care behaviors is a guideline-recommended and integral component of HF management.[4,7]

Self-care is a process in which patients are active participants in their HF management.[7] The 2013 American College of Cardiology Foundation/American Heart Association Guidelines for the Management of Heart Failure recommend that, "patients with HF should receive specific education that facilitates HF self-care."[4] A concept pertinent to HF patients in making decisions to perform self-care is self-efficacy, from Bandura's social cognitive theory.[8,9] Perceived self-efficacy is the confidence in one's ability to perform a behavior and to have control of health practices.[8,9] The level of self-efficacy one has, affects their commitment to performing behaviors that are necessary for personal health.[9] Studies have shown that when self-efficacy increases, self-care improves.[9] A vital component of HF education is empowering patients to perform healthy behaviors such as daily weight monitoring and medication adherence.

However, there is no gold standard method for HF patient education.[10] HF education is mainly provided by verbal teaching.[11,12] Yet, in the Need2Know-HF study that assessed the learning styles of HF patients, 64% of HF patients preferred a multi-modal style of learning.[13] Furthermore, the Heart Failure Society of America 2010 Comprehensive HF Practice Guidelines recommended that patients should be offered a variety of learning options including video.[7]

Video education (VE) may offer potential benefits including cost effectiveness and consistent messaging to patients resulting in

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standardized health information.[14] VE may enhance retention of health information. Additionally, 75% of information is absorbed visually,[15] making VE a practical option for sharing health information. VE may increase patients' confidence by showing actual persons living with HF modeling healthy behaviors, thereby demonstrating that healthy behaviors are achievable.[15] Additionally, patients may replay the videos at their own time and pace in their preferred setting until understood, thus VE is a patient-centered learning method. However, the use of VE in HF is not well studied.[15,16]

The Situation-Specific Theory of Heart Failure Self-Care[17] shaped our understanding of the influence of HF knowledge, self-care, and self-efficacy on HF management and guided the selection of outcome measures and instruments. The project was guided by two pertinent theoretical assumptions: self-care involves decision-making and self-care can be learned.[17]

We designed a rigorous quality improvement project with a mixed methods design that had two specific aims: 1) to evaluate the effects of adding VE to usual HF patient education on the following patient outcomes: HF knowledge, self-efficacy, self-care, 30-day readmission, and 2) to assess patients' satisfaction with VE.

Methods

Design and setting

Our project had a mixed methods approach. Quantitative data were collected to measure knowledge, self-efficacy, self-care, and 30-day readmission. To collect this data, we employed a prospective one group pre-test post-test design using a convenience sample with a historical comparison group. We also employed a qualitative methodology to determine patient satisfaction with the intervention. The project was conducted at a 600-bed teaching hospital, with a nationally recognized HF clinic. Enrollment was conducted on two 28 bed acute cardiology medical units where HF patients were predominantly admitted.

Human subjects

This project was reviewed by the university's Institutional Review Board for Health Sciences Research and determined to be a quality improvement project as it did not meet the criteria for research with human subjects or clinical investigation. Therefore, patient consent was not deemed necessary and the project exempt.

Inclusion/exclusion criteria

All patients were included if they were diagnosed with HF and 18 years of age or older. Exclusion criteria were patients under observation, medically certified as blind, diagnosed with a cognitive impairment, unable to read or write in English, and/or discharged to a skilled nursing facility, rehabilitation facility, hospice care/facility, long term acute care facility or to a prison.

Variables and measures

HF knowledge was measured using the Atlanta Heart Failure Knowledge Test (AHFKT). Cronbach's alpha of 0.87 was established.[18] In this project, the pretest Cronbach alpha was 0.70, the post-test was 0.78, and the combined pre-test and post-test, was 0.75. The AHFKT contains 30 multiple-choice questions covering pathophysiology, nutrition, behaviors, symptom management, and medications.[19] A score less than 80% indicates inadequate HF knowledge.[18]

Self-care was measured using the Self-Care of Heart Failure Index v.6 (SCHFI), a 22-item instrument with established validity and reliability.[20,21] SCHFI is divided into three sub-scales that reflect the components of HF self-care: self-care maintenance (symptom monitoring and treatment adherence), self-care management (symptom recognition, evaluation and taking action) and self-care confidence.[20,21] The self-care confidence scale was used to measure self-efficacy and has been utilized as a measure of self-efficacy in prior HF studies.[22,23] Each scale ranges from 0 to 100-points and a score of 70 or greater indicates adequate self-care.[20]

Thirty-day readmission was defined as all adult HF patients with an unplanned hospital admission within 30 days of hospital discharge.[24,25] Thirty-day readmission was measured as a dichotomous variable (yes or no). Then the all-cause 30-day readmission rate was compared to a randomly selected historical group of HF patients (September, 2016–November, 2016 cohort) who did not receive VE.

Patient satisfaction with VE was measured using an eight-item instrument developed by the project leader. The survey contained five statements rated on a four-point Likert scale and three open-ended questions to evaluate patients' overall experience with VE including video accessibility, as they were web based. Additionally, a self-reported video usage and rating log was used to collect information on the number of videos watched by each participant and the specific videos participants found helpful in managing their HF. The VE satisfaction questionnaire and the video usage and rating log were reviewed by the patient experience officer and the patient/family education librarian to ensure suitability for patients and considerations for low health literacy.

Demographic and clinical data collected included age, gender, education, the New York Heart Association (NYHA) functional classification, and comorbidities to determine the Charlson Comorbidity Index which predicts risk of death from comorbid diseases.[26] Additional data collected are noted in Tables 1 and 2.

Procedures

VE was added to the standard of practice (verbal HF education and written material) for selected patients. The HF videos were created by Milner-Fenwick, Inc., a health education company, whose HF videos have been cited in prior HF studies and disease management programs.[15,27,28] The videos included people of various ethnicities and displayed real-world scenarios that HF patients may navigate (e.g. dining out). Twenty-six HF videos comprising HF basics (including pathophysiology of HF), HF medications and the lifestyle changes needed for self-care were available to all participants. The total video content duration was 1 h 24 min and 5 s with individual videos typically three to four-minutes in duration.[29]

Eligible HF patients were recruited within 48 h of hospital admission if medically stable. Medical record reviews and patient interviews were conducted. Participants without NYHA classification in the medical record were classified utilizing clinical presentation on admission. The assigned NYHA classifications were then verified by a board-certified HF Nurse Practitioner. Participants completed the SCHFI and AHFKT for baseline measures. An overview of the videos was provided. Participants were shown how to access the videos on the internet and the first video in the catalog was played to display HF content.

Participants were encouraged to watch all the videos within seven days of hospital discharge. Participants were informed that they may watch the videos at their own pace, alone or with company while hospitalized and post hospitalization; that videos may be watched repeatedly and in their preferred setting, and that they were not required to watch them in a particular order. The videos were viewed on a personal computer, tablet computer or cellular phone with video and internet capabilities (e.g. smartphones). Participants were shown how to create internet shortcuts or bookmarks of the videos on their devices when permitted, to facilitate quick retrieval of the videos.

A video guide and a hospital card with the VE website address were provided to facilitate easy retrieval of the videos after discharge. The video guide also offered a standardized method to locate the videos and to minimize nursing staff burden in providing IT support.

Table 1
Sociodemographic characteristics

Variable	All enrolled participants ($n = 70$)	Participants completing study ($n = 30$)	Lost to follow-up ($n = 40$)	p value*	Test
Age (years), mean (SD)	65. 0 (12.9)	66.3 (11.7)	64.0 (13.8)	.448	1
Gender, n (%)				.002	2
Female	34 (48.6)	21 (70.0)	13 (32.5)		
Male	36 (51.4)	9 (30.0)	27 (67.5)		
Race, n (%)				.817	3
Black	21 (30.0)	9 (30.0)	12 (30.0)		
White	47 (67.1)	20 (66.7)	27 (67.5)		
Asian	1 (1.4)	1 (3.3)	0 (0.0)		
Hispanic	1 (1.4)	0 (0.0)	1 (2.5)		
Marital status, n (%)				.511	3
Never married	7 (10.0)	2 (6.7)	5 (12.5)		
Married	35 (50.0)	15 (50.0)	20 (50.0)		
Divorced	14 (20.0)	5 (16.7)	9 (22.5)		
Separated	1 (1.4)	0 (0. 0)	1 (2.5)		
Widowed	13 (18.6)	8 (26.7)	5 (12.5)		
Living arrangement, n (%)				.326	3
Living with spouse/ partner	39 (55.7)	14 (46.7)	25 (62.5)		
Living with other family	18 (25.7)	10 (33.3)	8 (20.0)		
Living alone	12 (17.1)	5 (16.7)	7 (17.5)		
Living with friends	1 (1.4)	1 (3.3)	0 (0.0)		
Education level, n (%)				.658	2
Did not finish high school	16 (22.9)	7 (23.3)	9 (22.5)		
High school graduate/ GED	32 (45.7)	12 (40.0)	20 (50.0)		
College graduate	22 (31.4)	11 (36.7)	11 (27.5)		
Employment status, n (%)				.491	3
Unemployed	5 (7.1)	2 (6.7)	3 (7.5)		
Full-time	8 (11.4)	1 (3.3)	7 (17.5)		
Part-time	4 (5.7)	2 (6.7)	2 (5.0)		
Retired	35 (50.0)	16 (53.3)	19 (47.5)		
Disabled	18 (25.7)	9 (30.0)	9 (22.5)		
Income, n (%)				.943	3
Less than $ 24, 999	30 (42.9)	13 (43.3)	17 (42.5)		
$25, 000 – $49, 999	16 (22.9)	8 (26.7)	8 (20.0)		
$50, 000 - $74, 999	2 (2.9)	1 (3.3)	1 (2.5)		
More than $75, 000	5 (7.1)	2 (6.7)	3 (7.5)		
Prefer not to state	17 (24.3)	6 (20.0)	11 (27.5)		
Type of insurance, n (%)					
No insurance	8 (11.4)	3 (10.0)	5 (12.5)	1.000	3
Private insurance	28 (40.0)	11 (36.7)	17 (42.5)	.622	2
Medicare	51 (72.9)	22 (73.3)	29 (72.5)	.938	2
Medicaid	13 (18.6)	7 (23.3)	6 (15.0)	.375	2
Other insurance	3 (4.3)	2 (6.7)	1 (2.5)	.573	3

Note. *p values of tests comparing those who completed ($n = 30$) with those lost to follow-up ($n = 40$); 1 = computed using Two-sided Independent samples t-test; 2 = computed using Two-sided Chi-square test; 3 = Exact Two-sided Chi-square test; 4 = computed using Mann-Whitney U test. Some patients had multiple types of insurance payment.

Participants were given the *Managing Your Heart Failure with Video Education* booklet developed for the project, which contained the video guide, video watching tips, and the need to know HF topics (hospital designated in keeping with current HF guidelines) with corresponding videos. This booklet was reviewed by a HF expert for HF patient suitability, by the patient education librarian for health literacy considerations and two co-authors for overall presentation.

Participants without internet access and/or a device to watch the videos were provided a loaned tablet computer (iPad) with internet access. Participants were taught how to use the iPads, including how to power on/off, and access and play the videos. Teach-back was used to verify understanding.[30] Participants receiving loaned iPads completed a device agreement form to return the equipment at their HF clinic follow-up appointment. Participants were informed of the post-tests and then given time to express concerns or ask questions. The project leader's contact information was provided to participants to address questions/concerns.

Most participants received a scripted telephone call and emailed reminder within 48 to 72 h after hospital discharge, as a reminder to watch the videos, complete the surveys and to identify any challenges with watching the videos such as a malfunctioning device. Participants with loaned iPads were reminded to return them. Evaluation of measures was conducted via paper-based questionnaires or electronically through a secure website link. Participants who completed paper-based questionnaires were provided with preaddressed postage paid envelopes.

Assuring quality and fidelity

The videos were vetted for content validity by nurses and physicians with cardiovascular patient care expertise, and were screened by the hospital's patient education committee. Unit staff were informed of the project. A protocol was used to guide project implementation assuring the same method of applying the intervention to each patient. An inclusion/exclusion checklist and protocol checklist were completed for each participant to facilitate protocol adherence. A script was used during follow-up telephone conversations. Notes were made by the project leader during enrollment and follow-up as needed. Discussions with HF experts continued throughout the project development and execution. Use of the aforementioned strategies helped to provide quality assurance of the project.[31] In order to assure intervention fidelity, the project leader delivered the intervention for each participant. Additionally, the intervention was provided in a standardized video format that provided fidelity to the educational component of the intervention.

Table 2
Clinical characteristics

Variable	All enrolled participants ($n = 70$)	Participants completing study ($n = 30$)	Lost to follow-up ($n = 40$)	p value*	Test
Charlson comorbidity, mean (SD)	5.8 (2.8)	6.2 (2.3)	5.5 (3.1)	.246	1
Comorbidities, n (%)					
Hypertension	55 (78.6)	25 (83.3)	30 (75.0)	.400	2
Diabetes Mellitus	38 (54.3)	19 (63.3)	19 (47.5)	.188	2
Hyperlipidemia	37 (52.9)	14 (46.7)	23 (57.5)	.369	2
Atrial Fibrillation	30 (42.9)	14 (46.7)	16 (40.0)	.577	2
Coronary Artery Disease	30 (42.9)	11 (36.7)	19 (47.5)	.365	2
Chronic Kidney Disease	27 (38.6)	11 (36.7)	16 (40.0)	.777	2
Obstructive Sleep Apnea	23 (32.9)	7 (23.3)	16 (40.0)	.142	2
Other cardiac arrhythmias	20 (28.6)	10 (33.3)	10 (25.0)	.445	2
Previous MI	17 (24.3)	6 (20.0)	11 (27.5)	.469	2
Depression	15 (21.4)	9 (30.0)	6 (15.0)	.130	2
Solid Tumor	14 (20.0)	8 (26.7)	6 (15.0)	.227	2
Valvular Heart Disease	12 (17.1)	3 (10.0)	9 (22.5)	.170	2
COPD	12 (17.1)	6 (20.0)	6 (15.0)	.583	2
Previous CVA/ TIA	10 (14.3)	3 (10.0)	7 (17.5)	.498	3
Peripheral Vascular Disease	10 (14.3)	3 (10.0)	7 (17.5)	.498	3
Liver Disease	4 (5.7)	3 (10.0)	1 (2.5)	.307	3
Obesity	14 (20.0)	5 (16.7)	9 (22.5)	.546	2
Current substance use	4 (5.7)	1 (3.3)	3 (7.5)	.630	3
Malignant Lymphoma	2 (2.9)	0 (0.0)	2 (5.0)	.503	3
Peptic Ulcer Disease	1 (1.4)	1 (3.3)	0 (0.0)	.429	3
Medication class, n (%)					
Diuretics	52 (74.3)	22 (73.3)	30 (75.0)	.875	2
Beta Blockers	51 (72.9)	21 (70.0)	30 (75.0)	.642	2
Statins	47 (67.1)	19 (63.3)	28 (70.0)	.557	2
Anticoagulants	24 (34.3)	11 (36.7)	13 (32.5)	.716	2
ACE Inhibitors	19 (27.1)	8 (26.7)	11 (27.5)	.938	2
Aldosterone Antagonist	13 (18.6)	6 (20.0)	7 (17.5)	.790	2
Angiotensin Receptor Blockers	10 (14.3)	5 (16.7)	5 (12.5)	.735	3
Digitalis	5 (7.1)	3 (10.0)	2 (5.0)	.645	3
NYHA classification, n (%)				.477	3
Class I	1 (1.4)	1 (3.3)	0 (0.0)		
Class II	14 (20.0)	7 (23.3)	7 (17.5)		
Class III	39 (55.7)	17 (56.7)	22 (55.0)		
Class IV	16 (22.9)	5 (16.7)	11 (27.5)		
Ejection fraction, n (%)				.098	3
HF*r*EF (EF $\leq$ 40%)	45 (64.3)	15 (50.0)	30 (75.0)		
HF*p*EF, borderline (EF 41% – 49%)	7 (10.0)	4 (13.3)	3 (7.5)		
HF*p*EF (EF $\geq$ 50%)	18 (25.7)	11 (36.7)	7 (17.5)		
Ejection fraction within last six months, n (%)	65 (92.9)	28 (93.3)	37 (92.5)	1.000	3
Length of stay, median (IQR)	5.0 (6.0)	4.5 (6.0)	5.0 (8.0)	.541	4
Hospitalizations in the past 12 months, n (%)	34 (48.6)	15 (50.0)	19 (47.5)	.836	2
Time since HF diagnosis, n (%)				.581	3
Less than 12 months	26 (37.1)	12 (40.0)	14 (35.0)		
1 - 5 years	26 (37.1)	9 (30.0)	17 (42.5)		
6 - 10 years	10 (14.3)	4 (13.3)	6 (15.0)		
Greater than 10 years	8 (11.4)	5 (16.7)	3 (7.5)		
Miles traveled to hospital, median (IQR)	40 (53.5)	40 (59.8)	40 (60.0)	.725	4
Travel time to hospital, n (%)				1.000	3
Less than 1 h	37 (52.9)	16 (53.3)	21 (52.5)		
1–2 h	22 (31.4)	9 (30.0)	13 (32.5)		
3 – 4 h	6 (8.6)	3 (10.0)	3 (7.5)		
5 h and more	5 (7.1)	2 (6.7)	3 (7.5)		

Note. *p values of tests comparing those who completed ($n = 30$) with those lost to follow-up ($n = 40$); 1 = computed using Two-sided Independent samples t-test; 2 = computed using Two-sided Chi-square test; 3 = Exact Two-sided Chi-square test; 4 = computed using Mann-Whitney U test. Most patients had multiple conditions and were taking multiple medications; HF*r*EF = HF with reduced ejection fraction; HF*p*EF, borderline = HF with preserved ejection fraction, borderline; HF*p*EF= HF with preserved ejection fraction; EF = ejection fraction.

Data analysis

Data were collected from September 03, 2017 to November 21, 2017, and analyzed using SPSS Statistics for Windows, Version 24.0 (Armonk, NY: IBM Corp). A two-sided p value of less than 0.05 was used to establish statistical significance. Means, standard deviations, frequencies and percentages are reported for descriptive data as appropriate. A paired samples t-test was used to analyze changes in scores from pre-test to post-test for these outcome measures: HF knowledge, self-efficacy (self-care confidence), and self-care maintenance. Due to fewer observations and asymmetry of the pre-post difference distribution, the pre-post changes in self-care management were analyzed with the Sign Test.

To determine the 30-day readmission rate, the number of all-cause 30-day readmissions by participants who completed the study was divided by the total number of participants who completed the study.[24,25] For comparison, a randomly selected sample of 30 patients was drawn from 122 adult HF patients discharged 12 months earlier from the same hospital (September 2016–November 2016). The 30-day readmission rates for this sample was examined via chart review and compared to the study sample using a two-sided Pearson's chi-square test.

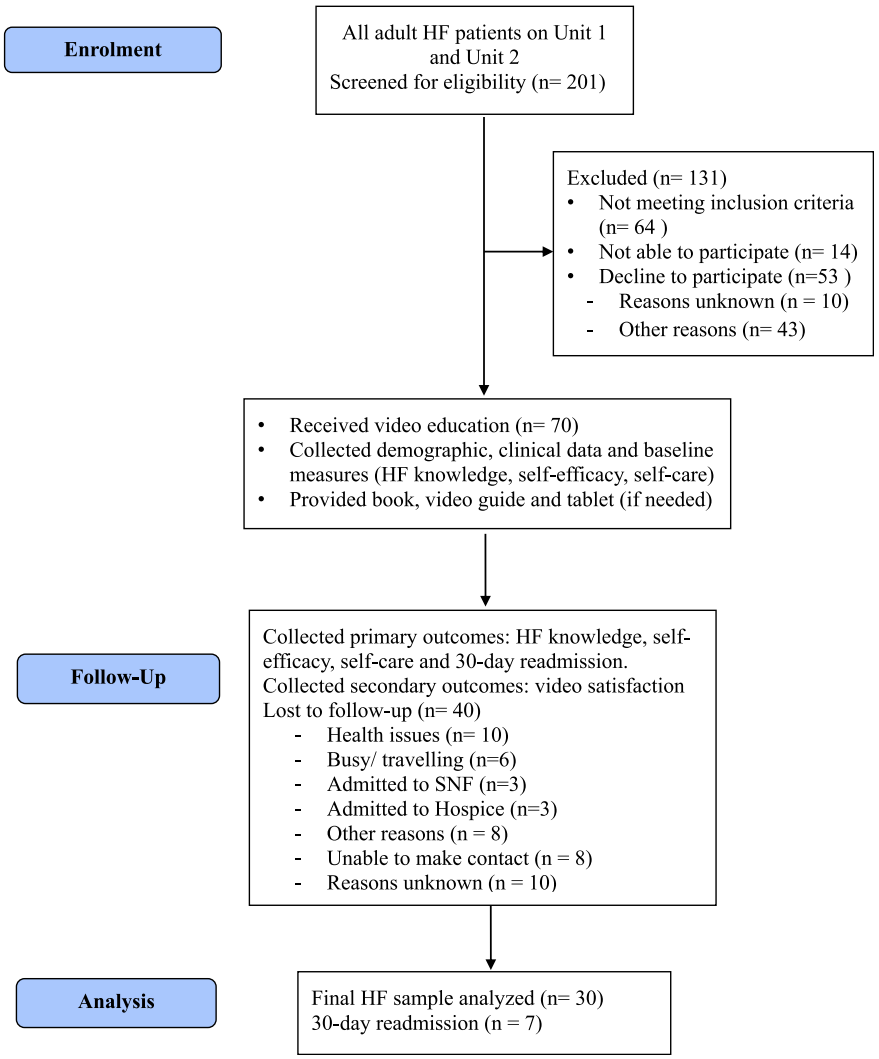

Fig. 1. Project flow diagram. Adapted from the Consort 2010 flow diagram.[42]

Descriptive statistics were reported for video satisfaction and video usage. Using Qualtrics, responses to the open-ended questions on the Heart Failure Video Survey were aggregated and analyzed for the presence of themes related to the experience of watching the videos. Themes were derived from common words identified and confirmed using an iterative approach.[32]

Results

Two hundred and one patients were screened for project inclusion. Sixty-four patients (31.8%) did not meet eligibility criteria, 53 patients (26.4%) refused and 14 patients (7%) were unable to participate. We enrolled 70 patients (34.8%) who met eligibility criteria. Of the 70, 30 patients (42.9%) completed the study and 40 (57.1%) were lost to follow-up. Fig. 1 presents the flow diagram of the project.

The mean age of those completing the study was 66.3 (SD 11.7) compared to the mean age of 65.0 (SD 12.9) for all participants; 21 (70%) were female, and 20 (66.7%) were white. Demographic and clinical characteristics are noted in Tables 1 and 2 respectively. Those completing the study and those lost to follow-up were compared on most demographic characteristics and differed significantly on only one (see Table 1). While men and women were enrolled in almost equal numbers, many more men than women were lost to follow-up. Those completing the study were 30% male, while those lost to follow-up were 67.5% male ($p = .002$).

HF knowledge

Knowledge scores significantly increased (mean pre-test = 22.67, SD 3.99; mean post-test = 24.37, SD 3.61; $p = .008$) (see Table 3) with a mean score improvement of 1.70, 95% CI 0.47, 2.93. Participants' scores improved by at least 5% on 20 of the 30 questions. Participants consistently performed poorly on the question about the recommended daily amount of sodium for persons with HF on both pre and post-tests.

Self-efficacy and self-care

Self-efficacy was evaluated by the self-care confidence scale of the SCHFI. Participants' self-care confidence scores did not significantly increase (mean pre-test = 69.31, SD 21.64; mean post-test = 70.98, SD 18.60; $p = .735$) with a mean score improvement of 1.67 (95% CI −8.30, 11.63).

The self-care maintenance scores significantly increased (mean pre-test = 67.22, SD 18.65; mean post-test = 81.18, SD 14.17; $p = .001$) with a mean score improvement of 13.97 (95% CI 6.13, 21.81). For the

Table 3
Results of the outcome variables

Outcome variables	Instrument used to measure the outcome variables	Frequency	Pre-test Mean (SD)	Post-test Mean (SD)	p value	Test
Knowledge of heart failure	Atlanta Heart Failure Knowledge Test	30	22.67 (3.99)	24.37 (3.61)	.008	1
Self-care maintenance	Self-care maintenance scale of the Self-care of Heart Failure Index	30	67.22 (18.65)	81.18 (14.17)	.001	1
Self-efficacy	Self-care confidence scale of the Self-care of Heart Failure Index	30	69.31 (21.64)	70.98 (18.16)	.735	1
Self-care management	Self-care management of the Self-care of Heart Failure Index	21	58.95 (23.98)	68.38 (20.56)	.454	2

Note: 1 = computed using the t-test; 2 = computed using the Sign Test.

Table 4
Patient satisfaction with video education survey results ($N = 26$)

Statements	Strongly agree n (%)	Agree n (%)	Disagree n (%)	Strongly disagree n (%)
It was easy to find the videos	17 (65.4)	8 (30.8)	1 (3.8)	0 (0.0)
I would recommend these videos to another patient with heart failure	17 (65.4)	9 (34.6)	0 (0.0)	0 (0.0)
The videos were meaningful to me	11 (42.3)	13(50.0)	2 (7.7)	0 (0.0)
I learned something new about managing heart failure	14 (53.8)	11(42.3)	1 (3.8)	0 (0.0)
I am satisfied with the information in the videos	14 (53.8)	11(42.3)	1 (3.8)	0 (0.0)

self-care management scale, only scores for 21 patients could be computed as nine participants did not report symptoms of difficulty breathing and/ or ankle swelling during the previous month. This scale requires participants to express having one or both symptoms, thus excluding asymptomatic patients.[18,33] Self-care management scores did not significantly improve (mean pre-test = 58.95, SD 23.98; mean post-test = 68.38, SD 20.56; p =.454); the median improvement in score was 0.0, IQR 22.00.

Hospital readmissions

The all-cause 30-day readmission rate did not significantly decrease (7/30 (23.3%) in study completers versus the historical group (9/30 (30%); p = .559). HF-related readmissions did not significantly decrease (3/30 (10%) in study completers versus 5/30 (16.7%) the historical group; p = .706). Five of the nine (55.5%) readmissions in the historical group and three of the seven (42.9%) readmissions for study completers were HF related.

Patient satisfaction with video education

Twenty six of the 30 patients (86.7%) who completed the project provided data on their overall satisfaction with the videos (Table 4).

The Heart Failure Video Survey included three open-ended questions at the end of the survey to obtain patients' personal experiences of watching the videos.

Question 1: What were the most important things you learned from watching the videos? The three main themes identified by patients were: (1) gaining knowledge and understanding of HF, (2) personal role in symptom recognition and surveillance and (3) awareness of the need for self-care.

Gaining knowledge and understanding of HF, and personal role in symptom recognition and surveillance

Participants were notably becoming aware of what heart failure is and understanding the condition (Table 5). The need for self-surveillance and attention to physiological changes was found in patients' comments. Table 5 shows an exemplar of a patient's reflective statement conveying how the videos could have changed the trajectory of his HF and that he would have been able to recognize the symptoms earlier to avoid HF exacerbation and hospitalization.

Awareness of the need for self-care in preventing HF symptoms and hospitalization

Patients commented on the HF management topics learned (Table 5). These included medication management, managing fluid, dining out, understanding food labels, sodium intake, and exercise.

Question 2: After watching the videos, what changes will you make in taking care of yourself with HF?

The common theme throughout the responses was the notable shift from being passive to active participants in their HF self-care maintenance.

Shifting from passive to active self-care maintenance

Participants outlined concrete steps they could take to manage daily living with HF including checking food-labels and exercising. In addition, patients shared psychosocial self-care changes that they were making for their overall well-being (Table 5).

Question 3: Do you have comments about using the videos as a part of your HF education?

The two themes arising from the qualitative analysis were: (1) length and quality of the videos, and (2) the quality of the information presented (Table 5).

Video rating and usage

Twenty four of the thirty patients (80%) rated the videos. The most highly rated videos were: *Heart Failure Medications: Diuretics* (71.4%, extremely helpful), *Managing Heart Failure: Limiting Sodium* (65%, extremely helpful), and *Taking Your Heart Failure Medications* (61.9%, extremely helpful).

Eighteen of the 24 patients (75%) who provided feedback watched 20 or more of the 26 videos, and 22 (91.7%) watched at least 16 (61.5%) videos. All 24 participants watched these four videos: *What is Heart Failure?, Managing Heart Failure: Energy Conservation* and *Managing Heart Failure: Handling Flare-ups*.

Discussion

This study used a novel approach by employing both quantitative and qualitative data to assess the effect of using VE in HF education. Our findings support current literature that suggests that VE is a

Table 5
Heart failure video survey qualitative findings

Survey Questions and Themes	Patient Quotes
Question 1: What were the most important things you learned from watching the videos?	
Gaining knowledge of and understanding what HF is	*"As a newly diagnosed heart failure patient, the videos provided me with basic information about heart failure and related topics that included diet and medications."*
	"what heart failure is and understanding it."
Personal role in symptom recognition and surveillance.	*"If I had seen the videos after my initial cardiac hospitalization in February 2016, I would have recognized the symptoms I was having sooner and avoided the second hospitalization November 2017 for pulmonary edema. Re: weight gain, shortness of breath, fatigue, increased thirst"*
Awareness of the need for self-care in preventing HF symptoms and hospitalization.	*"Do's and Don'ts. Proper management of my conditions. Importance of med-management."*
	"How to manage fluid intake. How to make choices and ask questions when dining out. Better understanding of food labels."
Question 2: After watching the videos, what changes will you make in taking care of yourself with heart failure?	
Shifting from passive to active self-care maintenance.	*"I never weigh myself, I just know about it during my appointments. Now I do it every day as well as taking my blood pressure wherein I list them and show these to my medical team. I now watch my medicine intake, take regular exercise much longer, involve family with my health problems, socialize more with friends."*
	"when eating out, I will ask for a nutrition guide. Also, when eating salads, I will reduce the amount of salad dressing."
Question 3: Do you have comments about using the videos as a part of your heart failure education?	
Length and quality of the videos	*"...They were short – didn't bombard you with too much information at one time..."*
The quality of the information presented	*"The videos were short enough, but informative enough to keep one's attention"*
Combining both themes: length and quality of the videos/ information	*"I consider the info an excellent and easily accessible resource. The videos are short enough to pack the important info into a space that is not boring. The headings allow the user to access exactly the info needed."*

patient-centered evidence-based intervention. We found that adding VE to usual HF education significantly improved HF knowledge and self-care maintenance. The improvement in HF knowledge is in keeping with prior studies.[34,35] Of note, improvements were seen in 20 of the 30 questions indicating that VE was associated with adequate knowledge of various components of HF self-care. The pre and post-test question with the lowest correct response evaluated sodium food content knowledge. HF patients have provided narrative accounts that adherence to a low sodium diet was a challenging skill. Narratives from HF patients such as "no sugar, no fat, no salt...what's left"[36] reveal the additive impact that results from managing multiple comorbidities and the required dietary changes. Patients may have difficulty assimilating and applying the many instructions for multiple medical conditions from different providers.[36] Family members may play a vital role in supporting patients' adherence to sodium restrictions, thus their HF knowledge is vital to achieving this end.[37] In collaboration with patients, consideration should be given to including families in education on sodium/ dietary restrictions. Also, HF patients may need regular consultation/ referral to a nutritionist to increase adherence to dietary restrictions.

Investigators evaluating VE using SCHFI with a follow-up of 1, 2, and 3 months post intervention, found high mean scores for self-care confidence and self-care management.[35] In another study[34] using SCHFI to assess self-care in patients who received VE, self-care confidence approached significance ($p = .051$) and statistical significance was achieved for self-care management ($p < .0001$). Of note, the follow-up period was 8 weeks.[34] Our participants may have needed more time to apply the knowledge being learned to improve self-management skills. Thus, a longer delivery of VE and follow-up may be necessary to adequately evaluate the effect of VE on self-care management and self-care confidence.

While statistical significance was not achieved for the changes in self-care confidence and self-care management, the changes in the pre-post test scores are of clinical relevance. The authors of SCHFI posit that a cut-point of 70 or greater is needed to judge achievement of self-care adequacy and stipulated that "benefit occurs at even lower levels of self-care."[18] Of note, the mean baseline pre-test values for all the scales indicate inadequate self-care (Table 3). Mean self-care management score increased by 9.43 points with patients nearing the cut-point (58.95, SD 23.98 to 68.38, SD 20.56). For self-care confidence, patients achieved the cut-point with mean scores increasing from 69.31 to 70.98. Patients' high comorbidity burden (mean Charlson Comorbidity Index = 6.2) may have contributed to the non-significant self-efficacy results. Prior studies have established an association between comorbity and self-efficacy.[22] As the level of comorbity increases, a decline in the relationship between self-efficacy and self-care maintenance occurs,[22] thereby reducing self-care behaviors.

We observed a non-significant reduction in all-cause 30-day readmissions in the sample versus the historical group. This result is similar to a study[35] that reported no significant difference in 30-day readmissions in patients who received supplemental VE compared to patients who did not. Although, the reduction observed was not statistically significant, any reduction in 30-day readmissions for HF patients has meaningful clinical implications for a condition with high associated morbidity and mortality rate as well as high economic burden on health systems.[1,2] Every admission avoided is a cost saving of US$10,900, the average cost of hospital stay for HF admission.[38]

Patients overwhelmingly found the videos meaningful and were satisfied with the information. Patient satisfaction with VE was consistent with prior studies.[15,16] Most of the patients found the videos easily retrievable. This is important in understanding HF patients' ability to use technology, especially in an older patient population, as the use of technology in HF care increases. Ninety-two percent of patients found the videos meaningful. This is the first evaluation to assess HF patients' perceived meaningfulness and helpfulness of using VE to learn about HF and self-care management.

Interestingly, 40% of the sample had HF for less than a year. Recently diagnosed patients may have an increased interest in learning about HF, thus a heightened readiness to learn. Using videos to

engage these patients early may help reduce HF-related complications. Furthermore, most of the patients had more severe HF symptoms (NYHA III), and hence, may be motivated in learning how to manage their condition.

We believe this is the first quality improvement project to evaluate the effects of VE delivered via mobile technology and tablet/personal computer. Prior studies used videotape and DVD formats.[15,16,34,35,39] Additionally, we conducted an item analysis of HF knowledge not seen in prior studies[34,35] that evaluated the impact of using VE for improving HF knowledge. This analysis will aid clinicians to better determine the focus of interventions at an individual, and/or local unit/hospital level by identifying patients' specific knowledge gaps and for individualized tailoring of the intervention.

The project overcame some of the challenges that may restrict patient participation such as not having internet access or the requisite technology. This data builds on the limited work done on the use of VE in educating HF patients and provides narratives of patients' experiences with VE. To achieve patient-centered care, obtaining the subjective experiences of HF patients facilitates an increased understanding of what patients consider meaningful in optimizing their self-care, and possible barriers from their perspective to achieving improved HF self-care.

This project is not without limitations. Our study design was not experimental, so the results should be interpreted with care. Convenience sampling was utilized; hence, the risk of bias and confounding factors. The inclusion and exclusion criteria along with a clearly outlined project protocol were used to introduce objectivity and reduce selection bias. The attrition experienced may have affected the findings particularly with more men being lost to follow-up and thus the sample may not be representative of the general HF population. It is unclear why more men were lost to follow-up. Some patients returned surveys beyond the intended seven days due to various circumstances including having procedures and traveling. The median days taken from pre-test to post-test completion was 13.5 days.

Since there was only one post-intervention measurement of participants, we were unable to determine if improvements in HF knowledge and self-care maintenance would be sustained or whether self-care management or self-care confidence would improve over time. This was a single site project; thus, generalizing to other settings may not be possible. For 30-day readmission, only data at the project site was used, so admissions to other hospitals may have been missed. To offset this limitation, patients were comprehensively tracked for 30 days by reviewing their medical record, contacting participants via phone and/or email post discharge (Fig. 1) and through communication with the HF Navigator who follows discharged HF patients to identify possible readmissions.

Practice and research implications

Adding VE to usual care is congruent with HF patients' preference for a multi-modal style of learning.[13] Nurses play an integral role in educating HF patients, spending many hours delivering information on HF self-care.[40] Using videos is a more efficient, patient-centered evidence-based intervention that is in keeping with HF guideline recommendations. Our findings indicate that VE is convenient and provides consistent HF education. The videos awakened many patients' need for better physiological maintenance and also the need to engage with family and friends, addressing the psychosocial impact of HF. Depression has been reported in HF patients[4] and is identified along with self-efficacy and social support as a significant predictor of self-care adherence.[21] We found that thirty percent of participating patients had a documented diagnosis of depression.

In aiming to provide efficient, effective and patient-centered care as recommended in the Institute of Medicine's (IOM) aims for improvement in healthcare,[41] the following suggestions were made based on patients' feedback. VE may be expanded to outpatient settings by playing videos on waiting room televisions or using portable electronic devices, so that patients and families may watch the videos during clinic visits. This extends HF education to caregivers and visitors. One patient also suggested providing information on related HF devices "*pacemakers/defibrillators*," thus VE may be expanded to other aspects of HF education/management.

Future research is needed to evaluate whether self-efficacy, self-management, and 30-day readmission improve with longer duration of exposure to the intervention and repeated follow-up. An experimental design with a larger sample and more equivalent gender distribution[15,35] may best determine the effect of VE on the outcomes studied. Future research may compare the delivery of HF patient education using a technology-based format like VE only or usual care and a technology-based format versus usual care only. HF outcomes of interest may be evaluated and patient perspectives on acceptability and comfort with technology determined so that recommendations for change in practice can be determined. Strategies for retaining male patients will need to be considered, which may include offering participation incentives that appeal especially to males and having additional methods for follow-up to complete the post-tests (e.g., telephone/face-to-face) at a convenient place and time.

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