

ORIGINAL ARTICLE

Development and Piloting of a Community-Partnered Heart Failure Training Course for Home Health Care Workers

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BACKGROUND: Despite their unique contributions to heart failure (HF) care, home healthcare workers (HHWs) have unmet educational needs and many lack HF caregiving self-efficacy. To address this, we used a community-partnered approach to develop and pilot a HF training course for HHWs.

METHODS: We partnered with the Training and Employment Fund, a benefit fund of the largest healthcare union in the United States, to develop a 2-hour virtual HF training course that met HHWs' job-specific needs. English and Spanish-speaking HHWs interested in HF training, with access to Zoom, were eligible. We used a mixed methods design with pre/postsurveys and semi-structured interviews to evaluate the course: (a) feasibility, (b) acceptability, and (c) effectiveness (change in knowledge [Dutch Heart Failure Knowledge Scale range 0–15] and caregiving self-efficacy [HF Caregiver Self-efficacy Scale range 0–100]).

RESULTS: Of the 210 HHWs approached, 100 were eligible and agreed, and 70 enrolled. Of them, 53 (employed by 15 different home care agencies) participated. Posttraining data showed significant improvements (pretraining mean [SD] versus posttraining mean [SD]; *P* value) in HF knowledge (11.21 [1.90] versus 12.21 [1.85]; *P*=0.0000) and HF caregiving self-efficacy (75.21 [16.57] versus 82.29 [16.49]; *P*=0.0017); the greatest gains occurred among those with the lowest pre-training scores. Participants found the course engaging, technically feasible, and highly relevant to their scope of care.

CONCLUSIONS: We developed and piloted the first HF training course for HHWs, which was feasible, acceptable, and improved their HF knowledge and caregiving self-efficacy. Our findings warrant scalability to the workforce at large with a train-the-trainer model.

Key Words: heart failure ■ home care aides ■ home health care ■ pilot study, feasibility studies ■ stakeholder engagement

Home healthcare workers (HHWs), which include home health aides, home care attendants, and personal care aides, are one of the fastest growing sectors of the healthcare industry and economy in the United States.¹ There are currently 3.4 million HHWs and they are projected to grow by 33% over the next decade.² Largely employed by Medicare-funded certified home care agencies and Medicaid-funded licensed home care agencies, HHWs provide daily or near-daily assistance

to older adults and those with chronic conditions in the postacute period or for long periods of time. This assistance often includes assistance with personal care (ie, activities of daily living and instrumental activities of daily living), medical care (ie, monitoring vital signs and symptoms), and emotional support and companionship.^{3–6}

Heart failure (HF) is one of the most common conditions for which home care services, including that of HHWs, are utilized.^{7,8} A few factors contribute to this.

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WHAT IS KNOWN

- Home healthcare workers (HHWs) frequently provide care to adults with heart failure (HF)
- Despite their integral role, many HHWs lack formal HF training and self-efficacy with caregiving in HF.
- Using a community-partnered approach, we developed and piloted a HF training course for HHWs.

WHAT THIS STUDY ADDS

- The HF training course was found to be feasible and acceptable among HHWs; it improved HHWs' HF knowledge and HF caregiving self-efficacy with the greatest gains occurring among those with the lowest precourse knowledge.
- The course has the potential for scalability to the HHW workforce at large using a train-the-trainer model.

Nonstandard Abbreviations and Acronyms

HF	Heart Failure
HHWs	Home Healthcare Workers

First, HF patients tend to be older, have multiple comorbidities, and a high prevalence of cognitive, functional, and sensory deficits, which often results in needing help at home with personal and medical care.^{9,10} Second, HF requires a high degree of self-care and symptom exacerbations are common, resulting in the need for additional caregiving and professional in-home support.^{4,11} Third, HF patients have high hospitalization rates, and home care is often used to stabilize the hospital-to-home transition.^{8,9} Indeed, a recent study of Medicare beneficiaries hospitalized for HF found that more than one-third were discharged home with home care services.¹² When caring for adults with HF, studies have found that HHWs frequently contribute to aspects of HF self-care including: preparing meals low in salt, taking vital signs, reminding patients to take medications, and taking patients to medical appointments.^{4,13,14} Despite these contributions, a recent survey of over 300 HHWs employed by 23 different home care agencies in New York, NY found that 66% lacked formalized training on HF.¹⁵ Additionally, only 44% felt confident providing HF-specific care.^{13,15} A lack of training and self-efficacy among HHWs may have adverse consequences for HF patients; indeed, studies have found that HHWs frequently call 911 when they have questions regarding HF care and are unsure of how to manage HF patients' symptoms at home.¹³ While some of these calls may be clinically necessary, others may be avoided if HHWs had the necessary HF training and self-efficacy to care for patients in the home.

These findings, alongside discussions with key stakeholders in home care,^{16,17} motivated the need to develop a HF training course for the HHW workforce. Additionally, home care agencies and worker unions are eager for innovative ways to empower HHWs to provide better HF care, since new home health payment models (eg, value based purchasing) are beginning to reward or penalize home health agencies for certain outcomes, such as unplanned hospitalizations, which are common in HF.^{18–21} Although HF training courses for family caregivers and other home-based health professionals exist (eg, nurses), they either do not cover all the aspects of care that HHWs provide (eg, ranging from monitoring symptoms, interpreting vital signs, to grocery shopping and preparing meals for HF patients) or they provide instruction on tasks beyond HHWs' scope of care (eg, administering medications) (see [Figure S2](#)).

To address these urgent needs, we used a community-partnered approach to develop and pilot the first HF training course for HHWs. In this study, we: (1) describe the development of the HF training course and (2) test its feasibility, acceptability, and effectiveness to inform future efforts to scale the course for this workforce.

METHODS

The data that support the findings of this study are available from the corresponding authors upon request. Analytical methodologies are discussed within this section, and selected study materials are also included in [Supplemental File 1](#).

Academic Community-Partnership

We conducted this study in partnership with the 1199SEIU Training and Employment Funds (TEF) of the 1199 Service Employees International Union United Healthcare Workers East.²² As the largest workforce development organization for adult workers in the United States, TEF provides quality education and skills enhancement training courses to more than 400 000 healthcare workers, of which 50 000 are HHWs. 1199 Service Employees International Union home care employers are required to provide 12 hours of in-service education to their employees, which is augmented by TEF's additional workplace skills and academic programs supporting education and career advancement. In-service training topics for HHWs cover mandatory topics (eg, infection prevention and emergency preparedness) and other topics defined by employers which HHWs take for maintenance of their Home Health Aide certification. The in-service courses are augmented with TEF workplace skills programs, which include disease-specific topics (eg, diabetes mellitus, hypertension) and methods to improve communication and reporting (eg, Interact Stop and Watch). Although these courses have traditionally been delivered in-person at TEF headquarter sites, this was no longer feasible during the COVID pandemic. During COVID-19, TEF worked to transition in-service training for this workforce to online platforms, including providing access to devices. Due to the timing of this study and COVID-19, this HF course was developed and piloted virtually to HHWs located throughout

New York, NY, and ultimately became the first course offered virtually to HHWs by TEF.

For this study, TEF staff worked closely with our study team on the design and recruitment of HHWs. They were not involved in data analysis and interpretation of findings. This study was approved by the Institutional Review Board of Weill Cornell Medicine.

Development of a Heart Failure Training Course for HHWs: A User-Driven Approach

To develop a HF training course for HHWs, we first conducted a separate qualitative study to understand HHWs' educational needs related to HF. The full details of this qualitative study are reported elsewhere.¹⁶ Briefly, we partnered with the TEF and asked 48 HHWs: (1) *What information about HF is most important for you to understand?*; (2) *Which symptoms that HF patients have worry you the most?*; (3) *What are common situations that you struggle with when caring for a HF patient?* From the open-ended responses to these questions, we generated a set of HHWs' HF educational priorities. For example, in that study HHWs reported that "counseling on diet" and "adherence to medication" with HF patients were top concerns of theirs. The data from this study informed our understanding of what HHWs wanted to learn about and the need to design a HF-specific course for this workforce.

Beyond course content, TEF and key stakeholders (HHWs, nurses, home care agency leaders) provided input on course style over the next year. There was an overwhelming preference from stakeholders for the course to be interactive and emphasize case-based learning, motivational interviewing, and role-playing of scenarios that HHWs encounter in the home.

Theoretical Underpinnings and Course Content

Based on this feedback, and guided by Adult Learning Theory,^{23,24} Social Cognitive Theory,²⁵ and the Situation-Specific Theory of Caregiver Contributions to Heart Failure Self-Care,²⁶ we spent 1 year developing an evidence-based HF training course for HHWs that we describe here. Collectively these frameworks emphasize a learner-centered approach, learning through peers and socialization, and the contributions that caregivers make to patients' HF self-care. Our investigative team developed the course content from published literature, clinician input (primary care physicians, geriatrician, geriatric cardiologist and HF specialists, nurse practitioners and registered nurses, and a physical therapist), and review of evidence-based guidelines (including from the American Heart Association, the Heart Failure Society of America, and American Association of Heart Failure Nurses)^{27–32} and resources from the National Association for Home Care & Hospice,²⁹ and discussions around the scope of care of HHWs in New York State with home care leaders and experts. The content was further refined after feedback from TEF staff.

For this pilot, the 2-hour course was co-taught by a primary care doctor (English-speaking) and nurse practitioner (Spanish-speaking) from our investigative team. The course provided an overview of HF (definition, pathophysiology), its epidemiology (who gets it and why), and its signs and symptoms. Most of the learning, however, was done through cases that covered symptom recognition (eg, leg swelling, fatigue, shortness of

breath), taking and monitoring weight and blood pressure, lifestyle behaviors (diet, grocery shopping and cooking, engaging in safe physical activity), and counseling around the importance of medication adherence. The instructors also reviewed how to recognize and handle emergencies in the home (including when to call for help) as well as how to efficiently communicate with patients, family members, and other healthcare providers (Figure 1). To supplement the virtual course, participants followed along with physical handouts of key concepts that were developed and mailed to each participant prior to the course.

Study Design for Piloting the Training Course

We used a single-arm, quasi-experimental design without a control group to pilot test the HF training course among HHWs from August 2020 to March 2021 in New York, NY. To be eligible, HHWs: (1) had to be currently employed by an 1199 Service Employees International Union participating home care agency, (2) speak English or Spanish, and (3) have access to Zoom and Internet. Because our eventual goal was to scale this course to the workforce at large, we recruited HHWs with interest in providing feedback on it and potentially teaching it in the future. Therefore, we included HHWs that: (4) participated in prior TEF educational courses, and (5) had interest in and/or some familiarity with HF, including receipt of prior general heart-health courses.

Based on these inclusion criteria, 1199SEUI-TEF staff assembled a convenience sample of 210 HHWs and assessed their interest via telephone using a prewritten script. If eligible and interested, HHWs were verbally consented by research staff and enrolled in a course in their preferred language. Because this was the first course offered on Zoom to HHWs, TEF staff worked closely with HHWs to conduct a precourse technology assistance session with participants. Each course session ranged from 4 to 8 learners. Aligned with HHWs' preferences, courses occurred at night (after work) or on weekends. Because this study occurred during COVID-19, which taxed the HHWs workforce,³³ we provided \$50 incentives to participants.

Data Collection

We used a mixed methods approach, conceptualized in accordance with the Health Equity Implementations Framework³⁴ with pretest/posttest measures and semistructured interviews, to evaluate the course feasibility, acceptability, and effectiveness among HHWs. We used this framework, given we were evaluating a novel intervention among a historically marginalized workforce.

Quantitative Data Collection

We asked participants to complete a questionnaire prior to the course to obtain their demographic information (age, sex, race and ethnicity, education level, nativity status), employment history (years of employment, current agency), and HF caregiving experience (number of HF patients previously cared for, receipt of prior HF training).

To assess feasibility, we tracked the number of HHWs who were approached, enrolled, and completed the course. To assess acceptability, we evaluated how participants accessed the course (connectivity and devices), whether they



Figure 1. *Examples of Content Delivered During Heart Failure (HF) Training Course for Home Health Workers (HHWs).

Figure legend (clockwise top left to right): sample case on interpreting vital signs (blood pressure and heart rate), grocery shopping case and identifying foods high in salt, traffic light tool used to help HHWs triage HF patients' symptoms as stable, in need of monitoring, and emergencies and the need to call for help. *Other examples of course material and broad descriptions and scope of practice of HCWs are outlined in Figure S2.

experienced technological challenges, and how they felt the course compared with their prior in-person educational courses (satisfaction, engagement, convenience). To do so, we used close-ended questions with Likert scales.

We evaluated 2 main outcomes: HF knowledge and HF caregiving self-efficacy. Secondary outcomes were: Caregiver Contributions to Self-care in Heart Failure Maintenance and Management. HHWs' HF knowledge was assessed with the Dutch Heart Failure Knowledge Scale, a 15-item valid and reliable instrument for measuring HF knowledge in clinical practice.³⁵ The scale is presented in a multiple-choice format, including questions on HF self-care activities and symptom management. Scores range from 0 (no questions correct) to 15 (all questions correct), with higher scores indicating greater HF knowledge. This scale has been found to be a valid and reliable instrument to measure patients', caregivers', and nurses' knowledge of symptoms related to HF, medication compliance, diet, fluid allowance, and physical activity. HHWs' HF caregiving self-efficacy was assessed with The Caregiver Self-efficacy in Contributing to Self-care Scale³⁶ is a 10-item instrument that measures caregiver self-efficacy (eg, confidence) in helping a patient perform self-care in chronic conditions. For example, "In reference to the person you care for, how confident you are that you can keep the person you care for stable and free of symptoms?" Our team previously validated this scale among HHWs.¹³ Each item uses a 5-point Likert-style response. Scores are standardized from 0 to 100, with higher scores indicating greater caregiver self-efficacy. A cut point of 70 or greater is considered adequate.³⁷ We also assessed HHWs' ability to contribute to their HF patients'

care activities using the Caregiver Contributions to Self-care in Heart Failure Maintenance and Management scales. These scales assess caregiver contribution to maintenance activities (10-items asking about caregivers' assistance in aiding patients to perform behaviors that keep them physiologically stable) and management activities (6-items asking about caregivers' ability to assist with HF symptom recognition).³⁷ Both have been previously validated among HHWs.¹³ Scores for each subscale range from 0 to 100, with scores ≥ 70 indicating adequate contributions.

Pre/posttest questionnaires were distributed in English and Spanish (Supplemental File 2). All quantitative data were collected and stored using Qualtrics.

Qualitative Data Collection

Using open-ended questions on the postcourse questionnaire, we assessed HHWs' attitudes toward the course by asking: (1) "What did you like about the HF training course?," (2) "What are the key takeaways you learned?," and (3) "What are the advantages and challenges of this online course compared with prior in-person trainings?" Additionally, a WCM research assistant, trained in qualitative research methods, conducted semistructured virtual interviews (via Zoom) with course instructors, TEF staff, and 12 HHWs to gain additional insight on the benefits of the course and ways to improve on it in the future. The interview questions were tailored to the stakeholder type. For example, course instructors were asked, "What is your perception of how well students understood and mastered the HF material presented?" Participants provided verbal informed consent

to record and publish deidentified excerpts from the interview. All interviews were audio recorded and transcribed.

Data Analysis

We characterized the sample's demographic data with descriptive statistics. We then compared mean and standard deviations for pre/postsurvey measures of effectiveness using paired *t* tests and Wilcoxon signed rank tests. According to the literature, clinically meaningful changes for both outcomes of knowledge and self-efficacy are point changes that are equal to or greater than half the standard deviation.^{37,38} Because we suspected that HHWs might have higher levels of knowledge and self-efficacy than HHWs not in the study, we next determined whether differences in measures of effectiveness differed by high versus low precourse scores. For the Dutch Heart Failure Knowledge Scale, a high pretest score was determined using a median split. For The Caregiver Self-efficacy in Contributing to Self-care Scale and the Caregiver Contributions to Self-care in Heart Failure, high pretest scores were based on a cut-point ≥ 70 previously used in the literature. Paired *t* tests were then used to assess whether differences in score change between high and low pretest score groups were statistically significant. To reduce the possibility of type 1 error due to multiple tests, the Benjamini-Hochberg procedure³⁹ was used (Table S1 and S2). Although the primary goal was to assess feasibility and acceptability, we conducted an exploratory analysis where we tested the association between HHW characteristics and change in both outcomes (HF knowledge and self-efficacy) adjusting for precourse scores. Characteristics with a $P < 0.1$ were selected and adjusted for simultaneously in 2 separate multivariable models (for each outcome). Quantitative analyses were conducted in Stata, version 14.

Although the development of the training course was informed by several theoretical frameworks, we used grounded theory to analyze the qualitative data instead of a specific pre-existing framework, given the novel aspects of this community-partnered course. In doing so, we used open coding to code the data inductively. Team members assigned codes to unique concepts; similar codes were consolidated into categories and ultimately themes, based on consensus. Given the small data set, qualitative analyses were done by hand, without the use of software. Our study was conducted in accordance with the Lett Criteria for qualitative research studies (Supplemental File 2)

RESULTS

Characteristics of Participants

A convenience sample of 210 HHWs were approached, of which 100 were eligible and agreed to participate. Among these, 70 HHWs enrolled in the course and started the precourse survey. Of the 70, 17 HHWs completed some of the precourse survey, but did not attend the course (eg, scheduling conflict, family obligation, etc). A total of 53 HHWs employed by 15 different home care agencies across New York, NY, enrolled and completed the training course, which was delivered across 7 separate sessions. Each course ranged between 4 and 9 participants. Four courses (total $n=25$) were conducted in

English, and 3 courses ($n=28$) were conducted in Spanish. All 53 HHWs who attended the course completed it. However, 5 participants were lost to follow-up and did not complete postcourse questionnaires; as such, they were excluded from analyses. Our final analytic sample composed of 48 participants (Figure S1).

The characteristics of the 48 participants analyzed are shown in Table 1. Overall, 63% were >45 years of age, 60% were Hispanic, and 10% were nonHispanic Black. Of the participants, 63% reported 1–5 years on the job, 20% reported 6–15 years, and 17% reported >15 years. With respect to prior experience caring for adults with HF, 22% had none, nearly 50% had taken care of 1–10 in the past, and nearly 10% had taken care of more than 10; 17% were unsure. Due to our sampling strategy and our aim to recruit HHWs interested in potentially teaching future iterations of the course, the level of prior training on how to care for HF patients was high, with 30% reporting to have received none to a little training and 71% receiving some to a lot. Of note, among the 17 HHWs who enrolled for the course but did not end up participating, 82% reported having little to no prior HF training (Table S3).

Pre- and Postcourse Quantitative Assessments

Analysis of pre/postcourse assessments demonstrated statistically significant and clinically meaningful gains in HF knowledge and HF caregiving self-efficacy, as well as in caregiver contributions to HF self-care after attending the course (Table 2). Overall, HF knowledge scores improved by 1.00 point ($P=0.000$) from 11.21 (SD 1.90) to 12.21 (SD 1.84), representing a statistically significant and clinically meaningful increase. Although participants had adequate HF caregiving self-efficacy at baseline (mean score of 75.21 [SD 16.57], with adequate including scores of 70 or greater), mean scores increased after the course by 7 points to 82.29 [SD 16.49] ($P=0.002$), which was statistically significant. In our exploratory multivariable models, none of the HHWs' characteristics were significantly associated with a change in HF knowledge and HF caregiving self-efficacy (Table S4 and S5). With respect to participants' ability to contribute to their HF patients' self-care maintenance and management activities, self-care maintenance scores increased by 8 points from a mean score of 80.71 [SD 19.00] to 88.72 [SD 11.24] ($P=0.007$) after the course, which was statistically significant. Self-care management scores also increased by 5 points from a mean score of 61.07 [SD 22.75] to 66.55 [20.23] ($P=0.033$), which was statistically significant.

Given that baseline scores among participants were high, we conducted additional analyses to determine whether participants with low baseline scores had greater improvements across these outcomes, than those with higher baseline scores. As shown in Table 3,

Table 1. Characteristics of Study Participants

Characteristics	N (%)
N	48
Age, N (%)	
18–30	5 (12%)
31–45	10 (24%)
46–55	17 (41%)
56–65	9 (22%)
*Race/Ethnicity, N (%)	
NonHispanic White	0 (0%)
NonHispanic Black	5 (10%)
Hispanic	29 (60%)
Asian/Pacific Islander	2 (4%)
Other	5 (10%)
Not reported	7 (15%)
Years worked as a home healthcare worker, N (%)	
1–5	26 (63%)
6–10	6 (15%)
11–15	2 (5%)
16–20	3 (7%)
20+	4 (10%)
Number of patients cared for in the past with heart failure (HF), N (%)	
0	9 (22%)
1–5	15 (37%)
6–10	5 (12%)
11–15	2 (5%)
15+	3 (7%)
Not sure	7 (17%)
Receipt of training on how to care for clients with HF, N (%)	
I've never received training on this	6 (15%)
I've received a little training on this	6 (15%)
I've received some training on this	9 (22%)
I've received a lot of training on this	20 (49%)

*Race/Ethnicity was self-reported and subsequently categorized.

participants with lower HF knowledge scores at baseline ($n=17$) improved by 1.82 points (SD 1.42), which was significantly greater than participants with higher HF knowledge scores at baseline ($n=30$), who improved by 0.53 points (SD 1.38), $P<0.004$. Similarly, participants with lower self-efficacy scores ($n=15$) improved by 13.17 (SD 18.29), which was significantly greater than those with higher self-efficacy scores at baseline ($n=32$), who improved by 4.22 (SD 11.70) points ($p=0.048$). Notably, participants with low contributions to self-care maintenance scores ($n=9$) improved by 35.56 (SD 25.77) points, which was significantly greater than the 1.49 (SD 9.29) point increase among the participants with high contributions to self-care maintenance scores at baseline ($n=38$) ($P<0.001$). A similar pattern was seen for caregiver contribution to self-care management.

Table 2. Comparison of Pre- and Post Heart Failure Training Course Assessments Among Home Health Workers (HHWs) Who Completed the Training Course

Outcomes	Precourse score mean (SD)	Postcourse score mean (SD)	P†
Dutch Heart Failure Knowledge Scale	11.21 (1.90)	12.21 (1.84)	0.000*
Caregiver contribution to self-care maintenance	80.71 (19.00)	88.72 (11.24)	0.007*
Caregiver contribution to self-care management	61.07 (22.75)	66.55 (20.23)	0.033*
Caregiver self-efficacy in contributing to self-care scale	75.21 (16.57)	82.29 (16.49)	0.002*

*Statistically significant.

†All P values remain significant even after Benjamin Benjamini–Hochberg correction (See Table S2).

Feasibility and Acceptability

All 53 HHWs who attended the course completed it (100%), although 5 did not complete the postcourse survey (48/53), resulting in 90.6% with postcourse data. To access the virtual course, 59% of participants used a smartphone, 27% used a laptop, 10% used a tablet, and 5% used a desktop computer (Table 4). Overall, 93% of participants were able to access and attend the course without technical problems. Most (76%) connected at home with the Internet, some (15%) with dial-up Internet, and 10% did not have Internet at home and reported using family members' Internet. A total of 85% of participants took the course at home, while 14% took the course “on the go” (eg, were away from their home). Compared with in-person courses (pre-COVID), 83% of participants reported that this virtual HF course ran more smoothly from an organizational perspective, 83% found it more convenient, and 78% found them more engaging.

Data from semistructured interviews were coded and analyzed, resulting in 2 major themes, as outlined below.

Theme 1. Bringing HF Knowledge from the Classroom to the Job

HHWs reported that the course offered valuable information on HF, which was relevant to their scope of practice. This included recognizing HF signs and symptoms, how to respond to emergencies, and how to encourage patients to adhere to the care plan.

“The course was very in-depth, and I learned how to spot the signs of worsening heart failure in the home, including when to call for help.” (HHW)

Many participants reflected that sharing real-life examples during the course was a highlight and enabled them to incorporate what they learned into their day-to-day work with patients.

Table 3. Comparison of Change in Pre- and Post Heart Failure Training Course Assessments, by Low Versus High Course Scores

Outcomes	Low prescore	High prescore	P†
Dutch Heart Failure Knowledge Scale			
N	17	30	
Score change, mean (SD)	1.82 (1.42)	0.53 (1.38)	0.004*
Caregiver contribution to self-care maintenance			
N	9	38	
Score change, mean (SD)	35.56 (25.77)	1.49 (9.92)	<0.001*
Caregiver contribution to self-care management			
N	28	15	
Score change, mean (SD)	10.56 (13.82)	−3.67 (16.31)	0.005*
Caregiver self-efficacy in contributing to self-care scale			
N	15	32	
Score change, mean (SD)	13.17 (18.29)	4.22 (11.70)	0.048*

The Dutch Heart Failure Knowledge Scale Ranges from 0 to 15, with higher scores indicating more knowledge; high scores are defined as ≥ 11 . The Caregiver Contribution to Heart Failure Self-care ranges from 0 to 100, with higher scores indicating greater contribution; adequate scores are defined as ≥ 70 .

*Statistically significant.

†All *P* values remain significant even after Benjamin Benjamini–Hochberg correction (see Table S3).

“...The course taught me how to cook healthy for my clients.” (HHW)

Participants also spoke about the benefits of group discussions, which allowed them to engage with their peers and instructors. Many HHWs enjoyed sharing their own examples of challenging or rewarding HF cases and receiving feedback from their peers, which they felt they would then put into practice.

“The discussions allowed us to learn from each other and that is so valuable to me because we are all home health aides with similar but different experiences... one aide taught me how she helps her client exercise and I used her tips with my patient.” (HHW)

Theme 2. Opportunities and Challenges of Virtual Training

Participants expressed that the virtual training course was generally more convenient for them than traditional in-person training. For example, virtual courses negated the need for public transportation and childcare coverage which carry monetary costs. HHWs felt that being able to take the courses “on the go” gave them additional flexibility to balance their work and personal obligations.

“I don’t need to find a babysitter to take it (course) anymore.” (HHW)

Participants also reported that the virtual HF training course, which did not require social distancing or public transportation, was a safer option to prevent COVID-19 transmission than in-person courses.

Table 4. Feasibility and Acceptability of the Training Course among HHWs Who Completed the Course

Assessment of Feasibility and Acceptability	N (%)
N	48
Device used to access the course	
Smartphone (eg, iPhone or Android phone)	24 (59%)
Tablet (eg, iPad or Android tablet)	4 (10%)
Laptop (eg, Windows, MacBook, or Chromebook)	11 (27%)
Desktop computer	2 (5%)
Experienced technical problems during the course	
No	38 (93%)
Yes	3 (7%)
Place where the course was physically taken	
I was at home in a private room or space	26 (63%)
I was at home in a shared or common room or space	9 (22%)
I was away from home, in a room in a public or shared space	3 (7%)
I was away from home, outside, such as a park or on the street	3 (7%)
Comparison between the virtual Heart Failure (HF) Training Course offered in this study versus previous in-person trainings	
Much less smoothly	1 (2%)
About the same	6 (15%)
More smoothly	10 (24%)
Much more smoothly	24 (59%)
Convenience of the virtual HF Training Course in this study in comparison with previous in-person trainings	
Much less convenient	1 (2%)
Less convenient	2 (5%)
About the same	4 (10%)
More convenient	14 (34%)
Much more convenient	20 (49%)
Degree to which virtual course was engaging compared with prior in-person courses	
Less engaging	1 (2%)
About the same	8 (20%)
More engaging	13 (32%)
Much more engaging	19 (46%)

Although many participants cited a high preference for virtual learning, a handful experienced challenges. For example, HHWs cited a lack of sufficient Internet connection and not being able to find a private and quiet space to take the class as barriers to learning.

Course instructors also expressed challenges with virtual learning that may have disrupted learning. While many participants were trained on how to use Zoom before taking the course, some still encountered challenges:

“I wonder if some of the aides got all the content, because a few were coming in and going out (of the Zoom) trying to fix their technology. For the people who did have experience on Zoom, the class was not as intimidating for them.” (Course instructor)

Course instructors also reported difficulties gauging participants' engagement and involvement virtually.

"It is hard to see if the aides who did not speak as much had learned something. There were a few people that we would have circled around to make sure they understood the course if we were in person."
(Course instructor)

DISCUSSION

We used a community-partnered approach to develop a HF training course for HHWs. Our findings suggest that the course was feasible, acceptable, and well-received by HHWs and key stakeholders in home health. Additionally, it significantly improved HHWs' HF knowledge, caregiving self-efficacy, and their contributions to aspects of HF self-care. The largest gains in these outcomes were observed among HHWs with low precourse scores, indicating that HHWs who may benefit the most from HF education are those with less HF knowledge and self-efficacy. Finally, our success with recruiting engaged and interested HHWs, alongside our partnership with a large union-affiliated training organization, offers potential for future scalability and dissemination of this course to the home care workforce at large via a virtual train-the-trainer model.

The improvements in knowledge, self-efficacy, and contributions to care that we observed among HHWs are consistent with prior studies that have assessed the benefits of HF training among patients, family caregivers, community health workers, and nurses^{40–43}; however, this is the first study of HHWs, a workforce increasingly caring for this patient population but without formal HF-training.⁴⁴ Notably, unlike family caregivers or community health workers, HHWs employed by Medicare and Medicaid-funded agencies must adhere to training requirements. Federal training requirements for Medicare, for example, state that home health aides need to complete at least 75 hours of instruction, including 16 hours of supervised practical training, through a state-approved program that follows federal regulations on content, delivery, and evaluation. They also have an annual requirement of 12 hours of in-service training per year.⁴⁵ Training often covers general topics like hygiene, infection control, healthy eating, and range of motion exercises. In recent years, and with significant investment from New York State's Workforce Investment Organization to strengthen and scale training among HHWs, TEF has offered additional courses on chronic diseases (such as diabetes mellitus, hypertension, COPD). However, there have been limited efforts to evaluate and report on the effectiveness of existing training courses for HHWs. To date, there have been two other disease-specific training programs formally developed and tested among this workforce. A study by Guerrero et al implemented

and pilot tested a competency-based training program for HHWs caring for Alzheimer's disease and related dementias.⁴⁶ The 10-week, 35-hour program was provided to 60 English and Spanish-speaking workers and found to improve their self-efficacy in caregiving skills and knowledge. Similarly, a physical activity-based training for HHWs by Muramatsu et al (2018) was shown to be well-received by aides and improve their patients' daily function and physical fitness.⁴⁷ Like ours, these studies were single-arm pilot studies composed of unionized and agency-employed aides. Future studies should build on these and test the effectiveness of these disease-specific training courses on not only HHWs but on the self-care and health outcomes of their patients.

Our study is unique in that we elicited input from our community partner (TEF), HHWs, and key stakeholders in home care at every step along the way. This input informed not only the topics covered during the trainings, but how they were delivered. Without this input, it is unlikely that our investigative team would have emphasized communication techniques or lifestyle coaching (eg, diet), over how to handle chest pain or arrhythmias, topics that are traditionally emphasized among hospital-based frontline healthcare workers but often overlooked among HHWs. The qualitative data indicated that HHWs found the case-based learning and peer support during the group-based discussions to be the most beneficial aspects of the training. This suggests that the format piloted here could be leveraged to meet other needs of this workforce, such as social isolation, that were exacerbated by the COVID-19 pandemic. In line with this, a recent study by Poon et al found that a virtually mediated peer support program by trained HHWs offered a safe space for HHWs to share their caregiving experiences, learn from each other, and foster empowerment and social support.⁴⁸ Taken together, educational courses like ours may be particularly important and effective among HHWs who often feel isolated in their work and lack support from their colleagues and generally feel invisible to the healthcare system.

Of note, studies of this workforce pre-COVID-19 found that HHWs wanted better access to technology for their work-related needs, but encountered barriers including a lack of self-efficacy using technology designed to support their education and work.¹⁷ However, like the rest of the health system, the home care industry was forced to adapt to a virtual landscape during COVID-19, both for surveillance purposes and for remote visits (by visiting nurses), information distribution, and training.^{38,49} This change in culture was seen during the study period, with TEF expending significant effort to on-board study participants (eg, Zoom readiness) who participated in this pilot, but also to implement online training to the workforce at large, provide devices so workers could access online training, and skill-building sessions to improve workers' self-efficacy with technology. Although

many HHWs in our study found benefits to virtual training (including convenience and safety), our qualitative data suggest that some HHWs still struggled, and this may be more widespread among a general population of HHWs. Therefore, future efforts to scale virtual training for HHWs will need to be coupled with programs to address technology access and readiness.

Strengths and Limitations

The strengths of our study include our community-partnered approach to recruit a diverse sample of participants. In addition, we used valid and reliable instruments to measure knowledge and self-care contributions and efficacy. Our mixed methods approach also allowed for in-depth insights on feasibility and acceptability. However, we also note limitations. As a feasibility pilot study, we used a quasi-experimental design without a control group; a more rigorous approach would have been to use a control group or to have conducted a randomized trial. Additionally, we lack data on retention of knowledge. Finally, although we intentionally recruited a highly engaged group of HHWs in a limited geographic region to participate in this pilot, we recognize this limits generalizability in that these participants had more prior training, knowledge, and self-efficacy with respect to this disease than HHWs at large.

CONCLUSIONS

Despite their unique contributions to HF patient care, HHWs have unmet educational needs. Using a community-partnered approach, we developed and piloted a virtual HF training program for HHWs. The course was feasible, acceptable, and improved HHWs' HF knowledge, caregiving self-efficacy, and their contribution to HF self-care principles. This course has potential for scalability to the workforce at large with a train-the-trainer model and may benefit HHWs who have less knowledge with HF care. Future studies are needed to test whether HHWs who received the training course retained what they learned over a prolonged period. Future work is also warranted to examine whether this training improved HHWs' caregiving skills and the health and outcomes (eg, avoidable hospitalizations) of their HF patients.

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Supplemental Material

Figure S1–S2

Table S1–S5

Supplemental File 1: Study Surveys

Supplemental File 2: Lett's Criteria Checklist

Supplemental File 3: AHA Journals Racial and Ethnic Disparities Reporting Guidelines

Supplemental File 4: STROBE Checklist

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