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Perceptions of changes in practice patterns and patient care among heart failure nurses during the COVID-19 pandemic

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A R T I C L E   I N F O

A B S T R A C T

Background: The Coronavirus (COVID-19) had a profound impact on the delivery of care in both hospital and outpatient settings across the United States. Patients with heart failure (HF) and healthcare providers had to abruptly adapt.
Objective: To describe how the COVID-19 pandemic affected practice patterns of HF nurses.
Methods: Practicing HF nurses completed a cross-sectional, anonymous, web-based survey of perceptions of HF practice. Analyses involved descriptive and comparative statistics.
Results: Of 171 nurses who completed surveys, outpatient HF visits decreased and 63.2% added telehealth visits. Despite spending about 29 min educating patients during visits, 27.5% of nurses perceived that the pandemic decreased patients' abilities to provide optimal self-care. Nurses reported decreased ability to collect objective data (62.4%; *n* = 78), although subjective assessment stayed the same (41.6%; *n* = 52).
Conclusion: Nurses' practice patterns provided insight into patient care changes made during COVID-19. Most core components of HF management were retained, but methods of delivery during the pandemic differed.

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Introduction

As the impact of the Sars-CoV2 (COVID-19) virus was felt across the nation, providing care for acutely ill adults with COVID-19 became a healthcare priority, over management of non-acute chronic illnesses, including heart failure (HF). In response to the escalation in COVID-19 cases, US healthcare system leaders prioritized personnel and resources to meet the immediate needs of infected patients, leaving patients and healthcare workers who specialized in chronic non-infectious disease, such as HF, to adapt to a new paradigm of care.[1,2]

Heart failure is a chronic, progressive condition requiring patients to navigate complex daily self-care behaviors including the management of complex medication regimens, fluid management, and daily monitoring of new or worsening symptoms. Some patients rely on their HF healthcare professional team and routine office visits to successfully manage their condition, especially adults who are newly diagnosed with HF.[3] Previous research on the practice patterns of nurses caring for patients with HF showed that they spent a significant amount of time educating newly diagnosed patients.[3] In addition, time spent in patient assessment can be challenging, regardless of whether patients are newly diagnosed or have chronic HF.

During the pandemic, as various regions of the country sheltered in place, clinic visits were halted or restricted, forcing dramatic changes in chronic care healthcare delivery. Healthcare professionals

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shifted care delivery to telephone calls or virtual visits.[4] Patients who were fearful of exposure to COVID-19, cancelled or rescheduled appointments for office visits and routine or emergent testing (laboratory or radiology) and some, despite experiencing increasing HF symptoms, chose not to seek care at the emergency department.[5] Telemedicine, defined as medical office visits delivered via a virtual platform- voice-only or combination video and voice, became the dominant mode of acute and chronic healthcare delivery.[6] The COVID-19 Preparedness and Response Supplemental Appropriation Act (P.L.116−123), which allowed unrestricted telehealth services to Medicare beneficiaries, was signed into law on March 6, 2020, just days before the country went into lockdown.[7]

In 2012, Prasun and colleagues conducted a national survey to determine the practice patterns of nurses caring for patients with HF.[3] Authors described nurses' practice patterns in five key areas: perceived self-care, assessment, education, diagnostic evaluation, and treatment plans. Since the COVID pandemic created challenges for nurses to maintain and optimize patients' health services amidst a shifting healthcare system, the purpose of this study was to determine nurses' practice patterns during COVID-19 in seven key areas: delivery of care method, perceived self-care, assessment, education, diagnostic evaluation, treatment, and utilization of national clinical practice guidelines. In addition, findings were compared to the results from a 2012 survey with the goal of informing HF nurses how HF care delivery may have evolved to meet patients' needs.

Methods

Design and sample

The study used a prospective, descriptive, cross-sectional survey design. Data were collected between September 2, 2020, to December 31, 2020, during the COVID-19 pandemic. The University institutional review board (IRB) of the principal investigator approved the anonymous survey as exempt research (IRB-2020−247). Recruitment was undertaken through the American Association of Heart Failure Nurses, which sent an email to its nursing membership (total population of 2200 practicing members), inviting study participation. Members received a research information memo with a description of the study and a secure Qualtrics survey link to electronically access the survey. Once the survey was accessed the nurses could only respond once to the questions. Consent to participate was assumed with survey completion. Up to 6 email reminders were sent. In the final two email blasts, members could snowball the survey to registered nurse HF clinician co-workers or HF advance practice nurse providers if their healthcare center allowed participation without local IRB oversight. The inclusion criteria was licensed registered nurses (RN) and advance practice nurses (APRN) who reported providing care to patients with heart failure. An *a prior* power analysis was conducted using G*Power 3.1.30[8] to compute the minimum required sample size of 160 in order to detect a moderate effect size ($\omega = 0.30$) with an adequate power (0.80), a significance level of 0.05, and *df* of 8.[9] A total of 171 surveys were completed by respondents for an estimated response rate of 7.8%.

Instrument

The survey was based on a previously validated tool that examined practice patterns of nurses who provided clinical care to patients with HF.[3] The 20-item survey incorporated previous components of demographics, perceived patient self-care, assessment, education, diagnostics, treatment and added questions regarding care delivery (telehealth), furlough, and HF guideline utilization. Responses to questions were based on frequency using a 5-point scale. For patient self-care and utilization of evidence-based guidelines responses ranged from 1 = *decreased substantially* to 5 = *increased substantially*.

Patient assessment, diagnostics, treatment, and care delivery (telehealth), responses ranged from 1 = *almost never* 5 = *almost always*. Time spent providing patient education ranged from a score of 1 = *vastly less* to 5 = *vastly more* and nurse satisfaction ranged from a score of 1 = *very unsatisfied* to 5 = *very satisfied*. Content validity was established through peer review of HF experts (HF nurse researchers and advanced practice HF nurses). Given that the majority of this instrument had been used previously[3] and because we were interested in deploying the survey as soon as possible to capture real-time information about how the pandemic was affecting practice patterns of HF nurses, formal pilot testing was not conducted. However, the instrument was shared with four nurses external to the study team to ensure the questions were clear and to estimate completion time. The internal consistency of the assessment and education section of this questionnaire ranged from Cronbach's alpha 0.73 to 0.93 for the present study. The internal consistency for the treatment/diagnostic items (e.g., orders for diagnostic studies, addition of medications, referral, or admission) was 0.93. Internal consistency was not calculated for other subsections of the survey, given the limited number of specific items for each subsection.

Data analysis

All data were entered electronically by respondents and analyzed in IBM SPSS Statistics for Windows, Version 25.0. Descriptive statistics were computed to describe sample characteristics and survey responses using frequency with corresponding percentage for categorical variables and mean with standard deviation for continuous variables. Exploratory factor analysis (EFA) with a principal component analysis and Promax rotation was used to extract assessment and teaching factors. Selected survey responses were compared by work setting, professional role, and certification using Chi-square tests, independent samples t-tests, and Mann-Whitney U test.

Results

The final sample of nurses (*n* = 171) was predominately female (94.7%; *n* = 162) with a mean (SD) age of 50 (12.0) years, and most had a bachelor's degree or higher. Professionally, participants identified as practicing clinical nurses (58.5%; *n* = 100) or as APRNs (40.4%; *n* = 69). Of the total sample, over half were certified (55%; *n* = 94), and the majority worked in an urban setting (77.8%; *n* = 133). See Table 1. Nurses reported an average of 16.2 (*SD* = 10.1) years of caring for patients with HF and worked in hospital/acute care settings (50.3%; *n* = 86) and ambulatory care (29.2%; *n* = 50). Of participants, RNs reported being furloughed from work more frequently than APRNs (see Table 1).

Changes in care delivery, clinic appointment and admit patterns

Overall, of the 147 who responded to this item, 51.8% (*n* = 66) stated that there was a decrease in the number of patients with HF that they cared for per week; however, 14.6% (*n* = 25) noted an increase in patient volume. Non-exclusive reasons provided for the need to receive care during the pandemic were HF exacerbation (72.8%; *n* = 91), medication titration (64.0%; *n* = 80), established patient visit (61.6%; *n* = 77), post-hospital discharge visit (53.6%; *n* = 67), and new-patient consultation (46.4%; *n* = 58).

Responding nurses reported using a wide array of remote monitoring services prior to the pandemic. Of services, telephone follow-up was predominant (57.9%; *n* = 99). Remote services were added by 63.2% (*n* = 108) of respondents. Responding nurses indicated that 47.0% (*SD* = 23.9) of patients wanted to continue virtual appointments at least 50% of the time post-pandemic (see Table 2).

Table 1

Demographic characteristics with comparisons by profession and practice setting (N = 169).

	Profession		Practice Setting	
Variables	RN (n = 100)	APRN (n = 69)	Hospital (n = 86)	Ambulatory Office (n = 61)
Age in years, M (SD)	48.4 (12.6)	52.3 (10.5)	46.5 (13.2)	54.8 (9.0)
Practice Setting, n (%)				
Hospital	60 (60.0)	26 (37.7)		
Ambulatory care or medical office	24 (24.0)	36 (52.2)		
Profession, n (%)				
RN			60 (69.8)	24 (39.3)
APRN			26 (30.2)	36 (59.0)
Highest Level of Education, n (%)				
ADN	9 (9.0)	0 (0.0)	5 (5.8)	2 (3.3)
BSN	65 (65.0)	0 (0.0)	40 (46.5)	18 (29.5)
MSN/MS	19 (19.0)	56 (81.2)	36 (41.9)	32 (52.5)
DNP	1 (1.0)	12 (17.4)	3 (3.5)	8 (13.1)
PhD	3 (3.0)	1 (1.4)	1 (1.2)	1 (1.6)
Other	3 (3.0)	0 (0.0)	1 (1.2)	0 (0.0)
Geographic Region, n (%)				
Midwest	26 (26.0)	22 (31.9)	23 (26.7)	21 (34.4)
Northeast	30 (30.0)	19 (27.5)	32 (37.2)	9 (14.8)
Southeast	21 (21.0)	20 (29.0)	18 (20.9)	18 (29.5)
Southwest	5 (5.0)	4 (5.8)	3 (3.5)	5 (8.2)
West	18 (18.0)	4 (5.8)	10 (11.6)	8 (13.1)
Average Number of HF Patients Per Week, n (%)				
0 to 5	19 (19.0)	5 (7.2)	19 (22.1)	2 (3.3)
6 to 10	21 (21.0)	17 (24.6)	23 (26.7)	10 (16.4)
11 to 20	19 (19.0)	20 (29.0)	22 (25.6)	15 (24.6)
21 to 30	11 (11.0)	10 (14.5)	12 (14.0)	5 (8.2)
31 to 40	5 (5.0)	5 (7.2)	1 (1.2)	7 (11.5)
41 to 50	6 (6.0)	6 (8.7)	3 (3.5)	9 (14.8)
51 or greater	19 (19.0)	6 (8.7)	6 (7.0)	13 (21.3)
Number of Years Working with Patients with HF, M (SD)	14.8 (10.1)	18.0 (9.9)	14.8 (9.8)	16.5 (9.2)
Certified in HF?				
Yes	44 (44.0)	48 (69.6)	44 (51.2)	37 (60.7)
No	56 (56.0)	21 (30.4)	42 (48.8)	24 (39.3)
Furloughed during the Pandemic, n (%)	18 (19.0)	5 (7.2)	9 (10.5)	9 (14.8)

Note. No attempt was made to estimate the missing data so the total for some variables may not equal to 171. APRN=advanced practice registered nurse, BSN=Bachelor of Science in Nursing, DNP=Doctorate in Nursing Practice, IQR = Interquartile range, *M* = Mean, Mdn = Median, MS=Master of Science, MSN=Master of Science in Nursing, RN=registered nurse, SD = Standard Deviation.

Perceived self care

Of the responding nurses, 27.5% perceived that the pandemic had prompted a decrease in patients' abilities to care for themselves. We asked nurses to report their perceptions of patient self-care during the pandemic, based on their judgments of patients who maintained both low and high control of their health pre-pandemic. Nurses perceived that the likelihood of a decline in patients' self-care behaviors during the pandemic was higher among patients who had displayed low control of their health pre-pandemic (46.2%; *n* = 79) compared to

Table 2

Telehealth prior and during the pandemic.

Variable	N (%)	M (SD)
Remote Services Prior Pandemic (n = 162)		
Telescales	32 (18.7)	
PA Pressure	57 (33.3)	
Device/Rhythm Monitoring	55 (32.2)	
Virtual Appointment	48 (28.1)	
Phone Follow-up	99 (57.9)	
Do not engage in Telehealth (n = 162)	48 (28.1)	
Facility instituted/added Telehealth during the pandemic (n = 159)	108 (63.2)	
On a scale of 0−100 what percent of patients are currently managed on Telehealth (n = 137)		46.1 (31.4)
What percent of patients would want to continue virtually would want to continue with virtual appointments 50% of the time?		47.0 (23.9)

M = Mean, PA = Pulmonary artery, SD = Standard deviation.

those who displayed high control of their health pre-pandemic (27.5%; *n* = 47).

Patient assessment and treatment

Nurses were asked how often they assessed physical, psychosocial, behavioral, and lifestyle activities when interacting with patients with HF during the pandemic. The assessment of physical comprised of lung and heart sounds, heart rhythm, jugular vein distention and oxygen saturation rates (SpO2) results. The psychosocial assessment was use of illicit drugs, over the counter medications, alcohol, depression, sleep habits, cognition problems and level of social support. Behavioral comprised of assessing the patient's weight, blood pressure, medication adherence, and if they knew when to call the HF team. Lastly, symptoms and lifestyle activities comprised of whether the patient had symptoms of orthopnea, postural nocturnal dyspnea (PND), fatigue, dyspnea, their activity level, and diet. Refer to Table 3 for survey responses with a comparison to professional role and practice setting. The nurses reported most often assessing symptoms and lifestyle activities (*M* = 4.2, *SD* = 0.8), followed by behavioral (*M* = 4.1, *SD* = 0.7) psychosocial (*M* = 3.8, *SD* = 0. 8) and finally, physical factors (*M* = 3.0, *SD* =1.3). (See Table 4).

Frequency of patient assessment during COVID-19 based on the four factors were compared by practice settings (hospital/acute, ambulatory cardiology/ medical office practice, and academic/federal government), and profession (RN, APRN). Overall, nurses working in hospital acute care settings had substantially higher perceptions of completing a physical assessment than nurses in ambulatory

Table 3
Perceived practice patterns with comparisons by profession and practice setting (N = 169)

Variables	Profession		Practice Setting	
	RN (n = 100)	APRN (n = 69)	Hospital (n = 86)	Ambulatory (n = 61)
Assessment Items, Mdn (IQR)				
Change in ability to collect subjective assessment data[a]	3.0 (1.0)	3.0 (1.0)	3.0 (1.0)	3.0 (1.0)
Overall change in ability to collect objective assessment data[a]	3.0 (1.0)	2.0 (1.0)	3.0 (1.0)	2.0 (2.0)
Assess1, Symptom & Lifestyle M (SD)	4.1 (0.8)	4.2 (0.7)	4.1 (0.8)	4.2 (0.7)
Assess2, Psychosocial M (SD)	3.8 (0.8)	3.8 (0.7)	3.8 (0.8)	3.7 (0.7)
Assess3, Physical M (SD)	3.4 (1.3)	2.5 (1.1)	3.6 (1.2)	2.4 (1.2)
Assess4, Behavioral M (SD)	4.3 (0.9)	3.9 (0.6)	4.2 (0.7)	4.0 (0.7)
Teaching Items, M (SD)				
Amount of time spent teaching patients with chronic HF	29.1 (17.9)	27.7 (18.9)	28.1 (16.8)	26.1 (16.3)
Teaching1 Volume & Self-care	4.3 (0.7)	4.5 (0.5)	4.3 (0.7)	4.5 (0.6)
Teaching2 Activity & Symptoms	3.8 (0.8)	4.4 (0.6)	4.1 (0.8)	4.4 (0.6)
Teaching3 Self-management	3.4 (0.9)	4.0 (0.7)	3.5 (0.8)	3.7 (0.9)
Plan of Care Items Mdn (IQR)[f] (Implementing or prescribing)				
Ordering laboratory test(s)[b]	4.0 (1.0)	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)
Ordering diagnostic test(s)[b]	4.0 (2.0)	3.0 (1.5)	4.0 (2.0)	3.0 (2.0)
Making referrals[b]	4.0 (2.0)	3.5 (1.0)	3.0 (2.0)	4.0 (1.0)
Admitting patient to hospital[b]	4.0 (2.0)	3.0 (1.0)	4.0 (2.0)	3.0 (1.0)
Starting or up-titrating loop diuretic[b]	4.0 (1.0)	4.0 (1.0)	4.0 (2.0)	4.0 (1.0)
Starting or up-titrating beta-Adrenergic blocker[b]	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)
Starting or up-titrating ACE-inhibitor, ARB, or ARNI[b]	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)
Starting or up-titrating aldosterone antagonist[b]	4.0 (2.0)	4.0 (2.0)	3.0 (2.0)	4.0 (1.0)

Note. Not all respondents provided answers for each question. Percentages shown in parentheses represent the percent within group. Abbreviations: ACE, angiotensin-converting enzyme; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor
[a] Responses based on 5-point Likert-type scale from 1 = decreased substantially to 5 = increased substantially
[b] Responses based on a 5-point Likert-type scale from 1 = almost never to 5 = almost always

cardiology practices (M = 3.6, SD = 1.2 versus M = 2.4, SD = 1.2, respectively; p = .000, Cohen's d = 0.96). There were no differences in the other three factors based on work setting. By nurses' roles, clinical nurses perceived that they were substantially to moderately better able to complete both a physical and behavioral assessment, compared to APRNs' physical assessment (M = 3.4, SD = 1.3 versus M = 2.5, SD = 1.1, respectively, p = .000, Cohen's d = 0.85) and behavioral assessment (M = 4.3, SD = 0.7 versus M = 3.9, SD = 0.6, respectively, p = .005, Cohen's d = 0.51).

Diagnostics and HF guideline utilization

APRNs and clinical RNs were asked about their perceptions of the frequency that they placed orders as part of the plan of care compared to before the pandemic. For laboratory tests, they reported a median (Mdn) of 4.0 with interquartile range (IQR) of 2.0 on a scale of 1= almost never to 5 = almost always. For other ordering practices, median scores were lower and reflected consistency compared to pre-pandemic; diagnostic testing (Mdn = 3.0, IQR = 1.5), referrals

Table 4
Ability to assess chronic heart failure during the pandemic.

Assessment Factors	M (SD)	Cronbach's α
Symptoms & Lifestyle	4.17 (0.75)	0.94
Orthopnea / PND / Fatigue / Dyspnea / Activity / Diet		
Psychosocial	3.80 (0.78)	0.90
Illegal Drugs / OTC Meds / Alcohol / Social Support / Depression / Sleep / Cognition		
Physical	3.01 (1.30)	0.95
Lung Sounds / Heart Sounds/ Heart Rhythm / JVD / SpO2		
Behavioral	4.10 (0.70)	0.82
Weight / BP / Medication Adherence / When to call HF team		

Note. Responses ranged from (1 = Almost Never, 2 = infrequently, 3 = sometimes, 4 = frequently, 5 = Almost always). BP = blood pressure, JVD = jugular vein distention, OTC = over the counter, PND = paroxysmal nocturnal dyspnea, SpO2 = oxygen saturation.
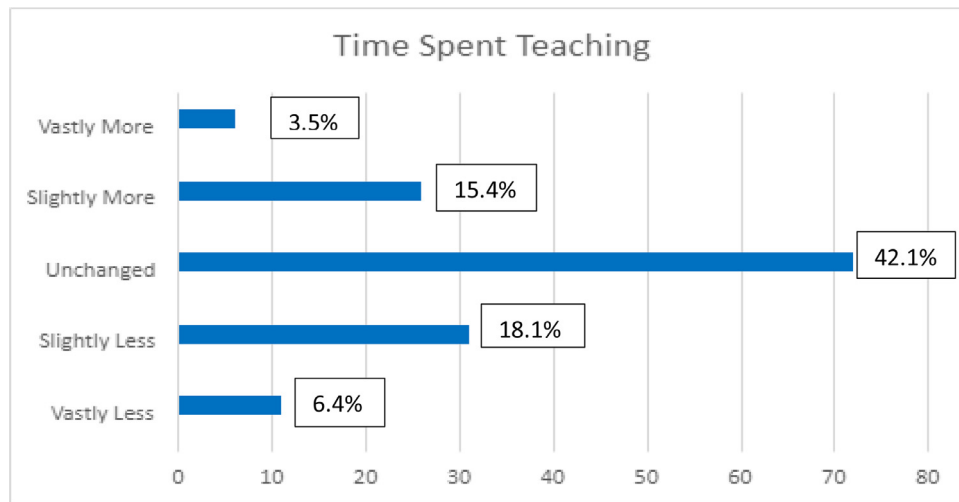
(Mdn = 3.5, IQR = 1.0), and hospital admissions (Mdn = 3.0, IQR = 1.0). Using the same scale, APRNs reported on their perception of the frequency that they prescribed guideline-directed medications now, compared to pre-pandemic. During the pandemic, they perceived frequently started or up-titrated loop diuretics, beta-adrenergic blockers, ACE-inhibitors, ARBs, or ARNIs, and aldosterone antagonists. (See Table 3).

Clinical RNs reported that orders were frequently made for laboratory tests, diagnostic procedures, referrals, and admissions to the hospital during the pandemic. They also reported that core HF medications were frequently prescribed; specifically, loop diuretics, beta-adrenergic blockers, ACE-inhibitors, ARBs, and ARNIs, and aldosterone antagonists during the pandemic. (See Table 3).

We found some differences between APRN and clinical RN reports of treatment plan implementation during the pandemic. The APRNs (Mdn = 4.0, IQR = 2.0) reported ordering laboratory tests less, based on a scale from 1 to 5, compared to the frequency with which clinical RNs (Mdn = 4.0, IQR = 1.0) reported ordering laboratory tests, U = 1903.0, Z = −2.51, p = .012. In addition, APRNs reported ordering diagnostic tests less than clinical RNs (Mdn = 3.0, IQR = 1.5 versus Mdn = 4.0, IQR = 2.0; U = 1748.5, Z = −2.99, p = .003); and lower patient admissions (Mdn = 3.0, IQR = 1.0 versus Mdn = 4.0, IQR = 2.0; U = 1477.0, Z = −4.09, p = .004). However, after Bonferroni adjustment to account for potential inflated type one error due to conducting repeated Mann-Whitney U tests in a series, the only difference between APRNs and clinical RNs in treatment plan decisions were diagnostic tests and admission to the hospital (adjusted significance level of p = .006).

Patient education

Of 146 nurses who responded to the question, "*compared to before the pandemic how much time are you spending teaching heart failure patients*?" 32 (18.7%) spent *vastly more or slightly more time* with their patients than pre-pandemic. Approximately 72 (42.1%) of nurses spent about the same amount of time and 42 (24.5%) felt that they spent *slightly less or vastly less time* educating their HF patients compared to before the pandemic. (See Fig. 1). Nurses estimated that they spent a mean (SD) of 28.5 (18.2) minutes providing education to each

Fig. 1. *Nurses Perceived Time Spent Teaching Chronic Heart Failure Patients During the Pandemic* (*n* = 146)
  Note. The blue bar reflects the number of respondents.

patient. Nurses were asked, "*how often they taught their HF patients*" (response range of 1 = almost never to 5 = almost always). Nurses perceived they taught *volume status and self-care* items most often (*M* = 4.4, *SD* = 0.6), followed by *activity* (*M* = 4.3, *SD* = 0.7) *and symptoms* items (*M* = 4.3, *SD* = 0.7) and *self-management* skills (*M* = 3.7, *SD* = 0.8) (See Table 5).

The three patient education factors were compared by practice settings (hospital/acute, ambulatory cardiology/medical office practice, and academic/federal government), profession (RN, APRN). Nurses in Hospital/Acute (*M* = 4.1, *SD* = 0.8) had a moderately lower mean on *Activity Level & Symptoms* than nurses in Ambulatory Cardiology/ Medical Office Practice (*M* = 4.4, *SD* = 0.6), *p*= .02, Cohen's *d* = 0.52. Whereas RNs (*M* = 3.4, *SD* = 0.9) had lower mean on *Self-Management* than APRN (*M* = 4.0, *SD* = 0. 7), *p* = .000, Cohen's *d* = 0.75.

Ability to follow national hf guidelines and overall satisfaction

Although 53.4% (*n* = 78) of 146 nurses stated that the pandemic did not change their ability to follow or apply clinical practice guidelines, 41.1% (*n* = 60) perceived that the pandemic decreased their ability to follow or apply clinical practice guidelines and 5.5% (*n* = 8) reporting no change. Nearly half of nurse responders (46.2%; *N* = 68) rated their satisfaction with care delivery to patients with HF as higher than pre-pandemic.

Discussion

In this study, clinical HF nurses reported their perceptions of the impact of the COVID-19 pandemic on practice patterns in key areas

Table 5
Teaching patients with chronic heart failure.

Factor	M (SD)	Cronbach's α
Teaching Factor **1:** Volume status & Self-care When to call the provide / Daily Weight / Diet / Medication Adherence / Dyspnea / Cough / PND	4.39 (0.64)	0.93
Teaching Factor **2:** Activity level & Symptoms Fatigue / Activity Tolerance / Lightheaded	4.26 (0.73)	0.92
Teaching Factor **3:** Self-management Pathology / Adjusting Own Diuretic / Limit Alcohol	3.65 (0.83)	0.73

Note. Responses ranged from (1 = Almost Never, 2 = infrequently, 3 = sometimes, 4 = frequently, 5 = Almost always). PND = paroxysmal nocturnal dyspnea.

(patient assessment, treatment, education, self-care, and ability to apply clinical practice guidelines) and methods of care delivery. In general, in-person care declined, in favor of telemedicine services, yet satisfaction with care delivery rose. Specifically, the nurses reported increased satisfaction with the clinical care provided during a time when U.S. COVID-19 infection rates were generally high and escalating. Of assessment skills, physical assessment was the most challenging, followed by psychosocial assessment. Of treatments delivered, nurses were divided regarding their ability to deliver care based on national HF guidelines; however, they perceived that core HF therapies were being titrated adequately. Despite the perception that patient education delivery by nurses was unchanged during the pandemic than pre-pandemic, nurses perceived that patients' self-care behaviors were below their pre-pandemic self-care levels.

Even though most nurses perceived patients preferred to not come in physical contact with heath care professionals in any healthcare setting, the nurses were creative in initiating and maintaining telemedicine visits. Our findings are similar to other reports in the literature in which telemedicine and remote monitoring services and protocols were escalated during the pandemic to meet health service needs of patients.[10−12] Interestingly, nurses perceived patients with HF would want to continue with virtual appointments, at least in part. Telehealth may offer advantages to patients, most importantly convenience; however, in an observational report, clinicians found data gaps (since telemedicine does not allow for thorough physical exam) that limited medication up-titration.[13] It may be that perceptions of lowered ability to complete a physical examination in this study compared to responses in 2012[3] where nurses reported almost always completing an examination and difficulty with following and applying the guidelines were also based on their inability to complete a physical exam during telemedicine visits. There is a need for innovations that accentuate physical examination findings in a virtual environment to allow for optimal telemedicine services.

During the pandemic assessment of symptoms, lifestyle and behavioral factors was lower than previously reported in the 2012 assessment of HF nurse practice patterns.[3] Assessment of psychosocial factors, including alcohol consumption, were historically low (*M* = 3.6; *SD* =1.3) and remained low based on current findings.[3] Improved orientation and emphasis of psychosocial assessment is needed especially in light of the increased use of alcohol and other substances during the pandemic.[14] Assessment of psychosocial factors is recommended, and abnormalities are frequently detected initially in health care settings.[15,16] Nurses play a critical role in assessing and identifying risk and distress. In addition, revision, or modification of electronic medical records to include assessments,

screening tools, and communication of psychosocial findings is needed.

It was interesting to learn that both clinical nurses and APRNs perceived medications were being adequately up titrated, yet many reported perceived difficulties in their ability to follow the guidelines. It is well known that core HF medications are not consistently optimized,[17] regardless of comorbidity status.[18] However, it was unsurprising to learn that clinical RNs were more likely to report seeing laboratory and diagnostic tests ordered and to see patients admitted to the hospital, compared to what APRNs reported, given that the majority of clinical RNs were based in the hospital setting, where patients may be unstable, requiring more invasive interventions and diagnostic testing.

It is important to note education persisted despite the pandemic. Over half of the nurses thought they spent slightly more or about the same amount of time educating patients with HF during the pandemic compared to pre-pandemic. Interestingly, compared to HF nurses reported education practice in 2012, topics and frequency of education reflected little change.[3] Although there was little change in education practices, time spent teaching patients about their HF was considerably less than the 60 min recommended in national guidelines.[19] Our statement wording was geared at teaching all patients, de novo and established and may reflect focused education discussions rather than global discussions.

During the pandemic, most outpatient education was provided virtually. There is little published literature on the effects of telehealth-delivered nurse education to patients with HF. In one report, authors found that teleconsultations by nurses were well tolerated by patients and helped to ensure the continuity of care for cardiovascular outpatients.[20] Research to discern if barriers to virtual education (for example, environmental distractions, pace of learning, and less ability to "read" the learner to assure understanding) can be overcome to achieve greater ability for patients to be in control of HF self-care expectations is needed. It may be that patients need to be assessed early on and over time for their ability to control their illness, based on our results of nurse perceptions that those with strong self-care behaviors remained strong in self-care and those with less adherence to self-care behaviors declined during the pandemic.

The nurses perceived that self-care behavior had changed in patients, with those who were successful in controlling their symptoms before the pandemic displaying relatively better self-care while those who were struggling to control their symptoms pre-pandemic displaying worsening self-care. Ultimately patients bear responsibility for incorporating and completing self-care activities and adequate knowledge helps support self-care activities.[21] The reason for this perceived difference in self-care behavior is unclear. We expected to see a decline in self-care across responses. The difference may be related to bias or how the nurses evaluate patient engagement. Others have reported that patients had difficulty maintaining self-care during the pandemic.[22] No studies comparing pre-pandemic behavior were located, but a study of COVID-19 related stress found that treatment adherence was mitigated by coping skills.[23] Challenges with self-care were described in specific cardiac populations such as patients living with a left ventricular assist device (LVAD) or atrial fibrillation (AF).[24] Inability to maintain a healthy lifestyle or monitor symptoms may be caused by lack of access to healthy food, lockdowns limiting physical activity, and decreases in social support.[24,25] Together these results suggest the nurses perceived the stress of the pandemic may have preferentially adversely affected patients who were struggling to adhere before the pandemic.

Limitations

In this research, we relied on nurses' self-report of perceptions of practice patterns and patient responses; an indirect method of assessment of patients, and who were members of the AAHFN

professional organization which may lead to biases. A survey was used to understand changes in practice patterns, because we did not know how long the pandemic would last when the study was initiated and were unsure if qualitative methodologies would be too difficult, as nurses had many demands on their time and additional stressors during the pandemic. The response rate was lower than expected; we acknowledge that the targeted nursing population may have experienced survey fatigue, as there was an increase in research, in general, related to resilience and workplace distress during the pandemic. Specific organizational or state policies governing nursing practice may have also affected participant responses; we did not collect information about hospital or state polices, only general information about practice authority. Also, we had few respondents from the western U.S and rural areas. It is unknown how many nurses received the research request on a workplace email address and were unable to respond during work, due to a lack of computers with internet access. Nurses' responses could have been regionally based, as pandemic rates differed by state, city, and type of organization, which could have influenced nurses' perceptions. Finally, perceptions of nurses may be imprecise for many reasons, including patient age, medical comorbidities, socioeconomic and psychological status, known preferences, family support and known barriers to health care. We did not measure patient factors, patient outcomes or healthcare site quality of care measures to discern if variability could have impacted nurse responses.

Conclusion

A better understanding of practice patterns of nurses may lead to new research and care delivery innovations that could enhance patient outcomes. Although core components of HF assessment and patient education were not perceived to have changed to a great degree since 2012, methods of delivery have changed. Since physical and psychosocial assessments were not as robust as desired when care was delivered remotely, it will be important to further develop technology and nursing skills to enhance opportunities for optimizing HF treatments based on clinical guidelines.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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