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Barbara Riegel, Victoria Vaughan Dickson, Janette Cameron, Jerry C. Johnson ...+3 more authors

Institutions: University of Pennsylvania, New York University, Australian Catholic University

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Barbara Riegel
University of Pennsylvania, briegel@nursing.upenn.edu

Victoria V. Dickson
University of Pennsylvania

Janette Cameron

Jerry C. Johnson
University of Pennsylvania

Stephen Bunker

See next page for additional authors

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Symptom Recognition in Elders with Heart Failure

Abstract

Purpose: Aging is associated with losses in hearing and vision. The objective of this study was to assess whether aging also is associated with less ability to detect and interpret afferent physiological information.

Design: A cross-sectional mixed methods study was conducted with 29 persons with a confirmed diagnosis of chronic heart failure of at least 6 months duration. The sample was divided at the median to compare younger (<73 >years) versus older (≥73 years) patients in the ability to detect and interpret their heart failure symptoms.

Methods: Shortness of breath was stimulated using a 6-minute walk test (6MWT) and used to assess the ability of heart failure patients to detect shortness of breath using the Borg measure of perceived exertion compared with gold standard ratings of each person's shortness of breath by trained registered nurse research assistants (inter-rater congruence 0.91). Accuracy of ratings by older patients was compared with those of younger patients. In-depth interviews were used to assess symptom interpretation ability.

Findings: Integrated quantitative and qualitative data confirmed that older patients had more difficulty in detecting and interpreting shortness of breath than younger patients. Older patients were twice as likely as younger to report a different level of shortness of breath than that noted by the registered nurse research assistants immediately after the 6MWT.

Conclusions: These results support our theory of an age-related decline in the ability to attend to internal physical symptoms. This decline may be a cause of poor early symptom detection.

Clinical Relevance: The results of this study suggest that there is a need to develop interventions that focus on the symptom experience to help patients—particularly older ones—in somatic awareness and symptom interpretation. It may be useful to explore patients' statements about how they feel: "Compared to what? How do you feel today compared to yesterday?"

Keywords

interoception, self-care, aging

Disciplines

Behavioral Medicine | Cardiology | Cardiovascular Diseases | Circulatory and Respiratory Physiology | Medical Humanities | Medicine and Health Sciences | Nursing

Author(s)

Barbara Riegel, Victoria V. Dickson, Janette Cameron, Jerry C. Johnson, Stephen Bunker, Karen Page, and Linda Worrall-Carter

Symptom Recognition in Elders with Heart Failure

Barbara Riegel, DNSc, RN, FAAN, FAHA
Professor, School of Nursing
Xi Chapter, Sigma Theta Tau
University of Pennsylvania, Philadelphia, PA

Victoria Vaughan Dickson, PhD, CRNP
Assistant Professor, College of Nursing
New York University, New York City, NY

Janette Cameron, BN, MHlthSc,
Doctoral Student, School of Nursing
Australian Catholic University, Melbourne, Victoria, Australia

Jerry C. Johnson, M.D.
Professor of Medicine and Chief, Geriatric Medicine Division
University of Pennsylvania, Philadelphia, PA

Stephen Bunker, PhD, RN
Formerly Senior Research Associate, School of Nursing
Australian Catholic University, Melbourne, Victoria, Australia

Karen Page, PhD, RN
Senior Research Associate, School of Nursing
Australian Catholic University, Melbourne, Victoria, Australia

Linda Worrall-Carter, PhD, RN
Professor, School of Nursing
Australian Catholic University, Melbourne, Victoria, Australia

Address for Correspondence
Dr. Barbara Riegel
University of Pennsylvania
School of Nursing
420 Guardian Drive
Philadelphia, PA 19104-6096
215-898-9927 (W)
240-282-7707 (FAX)
briegel@nursing.upenn.edu

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During the past two decades, the prevalence of heart failure (HF) has tripled and it now afflicts millions of people worldwide. In the United States alone, about 570,000 new cases are diagnosed each year (Lloyd-Jones, Adams, Carnethon, De Simone, Ferguson, Flegal et al., 2009). This equates to 2-3% of the total population, which is similar to the prevalence in Australia where this study was conducted (Australian Institute of Health and Welfare [AIHW], 2008). Costs of care associated with HF are enormous, in large part due to the steady increase in hospitalizations and use of intensive care (Liao, Anstrom, Gottdiener, Pappas, Whellan, Kitzman et al., 2007). Heart failure also adversely affects survival. Within 5 years of diagnosis, only 1 in 5 HF patients is still alive, making HF as deadly as many cancers (Goldberg, Ciampa, Lessard, Meyer, & Spencer, 2007).

Heart failure predominantly affects individuals over the age of 65 (Masoudi, Havranek, & Krumholz, 2002). In this group, HF is the number one discharge diagnosis and cause of hospital readmission within 60 days (Miller & Missov, 2001). Heart failure care constitutes the single largest Medicare expenditure (O'Connell, 2000); 27% of patients are readmitted within 90 days for recurrent HF, 29% of these are readmitted more than once, and close to half are readmitted within six months (Miller & Missov, 2001). In elderly HF patients who have three or more risk predictors, six month all-cause readmission is nearly 60% (Krumholz, Chen, Wang, Vaccarino, Radford, & Horwitz, 2000). Most of these readmissions are thought to be preventable with self-care (Rich, 2002).

Self-care is defined as a naturalistic decision making process used by patients to maintain their health and deal with symptoms when they occur (Riegel, Carlson, Moser, Sebern, Hicks, & Roland, 2004). Self-care involves adherence to treatments, monitoring for changes in symptoms, and managing these changes when they occur. Managing changes in signs and symptoms cannot occur, however, until patients recognize their symptoms. By recognition, we mean becoming aware of, identifying, and distinguishing symptoms of HF from other potential causes. We have shown in prior research that persons with HF commonly fail to recognize their early symptoms quickly (Carlson, Riegel, & Moser, 2001). Patients with a history of HF have an especially long duration of dyspnea, edema, cough, and orthopnea prior to hospital admission (Friedman, 1997) compared to other patient populations, suggesting that they either become accustomed to having ubiquitous symptoms or are unaware of their increasing severity.

We suspect than an age-related inability to detect and interpret symptoms may be an important cause of poor self-care. If symptoms are not detected early and interpreted correctly, patients cannot be expected to initiate self-care before an acute exacerbation occurs. Although decreased sensory perception is known to occur with aging (Battaglia, Sandrini, Catalano, Arcoleo, Giardini, Vergani et al., 2005), it has not been explored as a potential reason for decreased symptom recognition and poor self-care in the aging HF patient population. The purpose of this mixed methods exploratory study was to discern how age influences the ability to detect and interpret early HF symptoms. We hypothesized that younger patients would detect and interpret their HF symptoms more accurately than older patients.

Background

Despite the essential contribution of HF self-care to maintaining patients in a stable state, there is surprisingly little research addressing age-related symptom detection and interpretation as a contributor to delay in response to increasing symptom severity. Jurgens (2006) describes this phenomenon as somatic awareness or the sensitivity to physical sensations secondary to physiological change. Studies of other populations suggest that the degree of pathophysiology (Frasure-Smith, 1987; Warner, 1995), environment, experience, interpretation, and psychological state (Watson & Pennebaker, 1989) all influence somatic awareness. Elders may discount early symptoms of HF decompensation, such as fatigue and dyspnea, by attributing them to a benign cause such as aging (Stoller, Forster, Pollow, & Tisdale, 1993). Difficulty in determining the meaning of symptoms leads to uncertainty (Miller, 2000; Winters, 1999) and HF symptoms often increase in an insidious fashion, which may impede early recognition. Further complicating the physical symptom experience is the sheer number of potential symptoms, some of which are secondary to comorbid illnesses and pharmacologic therapy. To date, poor HF symptom detection and interpretation have been attributed to symptoms that are insidious, ambiguous, or non-specific, not to aging.

Poor interoception—the process by which sensory nerve receptors receive and process stimuli that originate inside the body—is another possible cause of failure to detect and interpret HF symptoms. Visceral sensory receptors or interoceptors include physiological receptors that monitor ongoing function of visceral organs and mediate visceral reflexes. Studies of age-related differences in interoception are rare, but younger persons are better at detecting their pulse rate than older people (Cameron, 2001). In one study, elders were hypothesized to perceive less dyspnea than younger persons (Battaglia et al., 2005). Dyspnea at rest was measured with a visual analog scale (VAS) in persons with asthma; 18 >65 years were compared to 20 ages 16-44 years. Elders had lower VAS scores (9.9+/-19.8 mm vs. 19.5+/-17.0, $p<0.05$) than the younger patients, which was interpreted as evidence that aging is associated with a blunted sensation of dyspnea. Few other studies of interoception in elders have been conducted.

Self-care intervention research is hindered by our inability to determine why persons with HF are poor at early symptom recognition. If we can discern whether elders have become accustomed to their symptoms or if they are unaware of their increasing symptom severity due to age-related changes in sensory perception, intervention approaches could be designed to address the cause. If patients are able to detect their symptoms but choose to label them with a relatively less threatening interpretation, patient education could be used to teach the importance of an early response to symptoms. But, if patients are unable to detect increases in symptom severity due to poor sensory perception, interventions would focus on improving somatic awareness. Thus, we conducted a study to assess HF symptom detection and interpretation in older adults.

Methods

During the early months of 2008, we conducted a cross-sectional, mixed methods study to assess HF symptom detection and interpretation ability. Detection refers to the ability to sense or perceive a stimulus in response to afferent physiological information. Interpretation refers to understanding, or the attribution of a symptom experience to the appropriate source. Shortness of breath (SOB) was stimulated using a 6-minute walk test (6MWT) and used to assess the ability of HF patients to detect SOB. Patient ratings were compared to gold standard ratings of each person's SOB by trained registered nurse research assistants (RNRA), as described below. Accuracy of ratings by older HF patients was compared to those of younger HF patients. In-depth interviews were used to assess symptom interpretation ability.

Sample

Patients with a confirmed medical diagnosis of chronic HF of at least 6 months duration, New York Heart Association (NYHA) class II or III were enrolled. Only those mentally alert enough to complete procedures were included (Mini Mental State Exam >24). No gender or ethnic group limitations were imposed but patients were excluded if they had a disorder known to cause systemic weakness or fatigue, since these symptoms change the context in which HF symptoms occur: active cancer, chronic obstructive pulmonary disease (COPD), hypercalcemia, hypo or hyperthyroidism, weight loss of unknown etiology, and the presence of psychotropic medications. In addition, persons with HF due to a recent (six months) myocardial infarction or angina pectoris in the prior three months were excluded because symptoms of ischemia can manifest as dyspnea, introducing a confounding variable. Those institutionalized in an extended care facility were excluded. Enrollment and data collection took place at four out-patient sites in Melbourne, Australia.

A purposive sampling strategy of maximum variation was used. Maximum heterogeneity was sought on attributes anticipated to affect symptom perception abilities: age, gender, functional class, and length of time with HF (Cameron, 2001). Maximum variation sampling was monitored by tracking these characteristics among the recruited sample. Although the final sample was predominately male, maximum variation was achieved on the other characteristics.

Procedure

After providing informed consent, patients completed baseline questionnaires. Vital signs, NT-ProBNP, and oxygen saturation were assessed to assure that it was safe to proceed with the 6MWT. The 6MWT is widely used as an outcome measure in HF research (Galbreath et al., 2004; Masoudi et al., 2004) but it also has been used as a stimulus in studies of somatic awareness (Radke, King, Blair, Fitzpatrick, & Eldredge, 2005). The 6MWT, administered using a standard protocol, was used to increase respiratory effort sufficiently to stimulate shortness of breath. Patients were encouraged to walk as quickly as possible during the 6MWT, using encouragements such as “Walk your fastest”. The qualitative interview was conducted immediately following the 6MWT or at a later date, if the patient was fatigued. Interviews were conducted in the clinic, in the home, and occasionally by telephone.

Measurement

Patient interview, surveys, and medical record review were used to collect clinical and sociodemographic characteristics. Variables particularly important to measure in this study were age, gender, functional status, body mass index (BMI), fitness, and perceived health as these factors can influence somatic awareness (Cameron, 2001; Ramasamy et al., 2006). Comorbid illnesses were assessed using the Charlson Index (Charlson, Pompei, Ales, & MacKenzie, 1987).

Age and gender were assessed by self-report. Height and weight were measured by the RNRA on the day of testing and used to compute BMI. Fitness was assessed by asking patients how much they exercised, defined as strength training exercises or aerobic exercise such as walking, swimming, gardening, or active housework in the past week, even if it did not reflect a typical week. The choices were none, less than 30 minutes, 30-59 minutes, one to three hours, or more than three hours. Perceived health was assessed using the single item from the Medical Outcomes Study in which patients were asked to rate their health in general as excellent, very good, good, fair, or poor. Arterial oxygen saturation was measured with pulse oximetry. Blood was drawn by venipuncture and tested for NT-ProBNP level before the 6MWT was done using a point-of-care device from Roche.

Participants were asked to rate their shortness of breath on a 100 mm VAS and on the Borg measure of perceived exertion (Borg, 1990) before the 6MWT, immediately after, and five minutes later. The RNRA rated the patient's shortness of breath numerically on the same scales and at the same time as the patient (immediately prior to, immediately after, and five minutes after the 6MWT). Congruence between RNRA and patient scores was used as the primary measure of symptom detection ability. Two RNRA administered the 6MWTs so inter-rater reliability was assessed on several non-study patients undergoing a 6MWT. Rater congruence was .91 on the Borg measure of perceived exertion and .83 on the VAS. In-depth discussion was used to raise inter-rater reliability. Because inter-rater reliability was higher with the Borg than with the VAS measures, the Borg was the focus of this analysis.

Qualitative Interviews

The ability to interpret symptoms was assessed by a semi-structured interview. A series of open-ended questions and probes was used to focus the interview while allowing the participant to speak freely. To assess the patients' awareness of shortness of breath and its causes, they were asked to describe how they detect and interpret their symptoms, manage them, and decide on a course of action when symptoms occur. Two styles of probes were used to facilitate the interview: recapitulation used to direct those who stop talking back to previous comments to clarify or elaborate on descriptions; and silent probes, thoughtful periods of silence used to allow reflection (Speziale & Carpenter 2003). Each RNRA collecting the data was trained carefully by the qualitative research expert (VVD). Interviews were audiotaped and transcribed verbatim for analysis. The first interview from each RNRA was reviewed immediately to assess interview technique and to confirm fidelity to the interview guide.

Data Analysis

The sample was divided at the median into two approximately equal groups based on age (<73 years (n=13) vs. ≥73 (n=16) years). The hypothesis that younger patients would detect their HF symptoms more accurately than older patients was tested by coding for a discrepancy between patient and RNRA ratings of shortness of breath on the Borg scale at each assessment period. Ratings of shortness of breath on the Borg scale were coded as consistent with or different than the RNRA rating, regardless of whether the patient ratings were higher or lower. The proportion of patients with a discrepancy in ratings was compared by age group using Fisher's Exact Test. A p-value of ≤ 0.10 was considered statistically significant for all analyses because of the exploratory nature of the study. Statistical analyses were performed using SPSS 15.0 (Chicago, IL).

To explore age-related differences in symptom detection and interpretation ability we analyzed the interview data using Atlas *ti* 5. Transcribed data were analyzed to obtain data clusters (Hsieh & Shannon, 2005) and then linked to the factors thought to contribute to symptom detection and interpretation (e.g., perceived health). After this preliminary coding, within-case analysis was used to identify the key elements of each individual's account of HF self-care (Ayres, Kavanaugh, & Knafl, 2003). Themes that emerged were then examined across cases to identify commonalities for all subjects and variations of themes by age groups. Methodological rigor of the qualitative analysis was maintained through an audit trail, periodic debriefing with the co-investigators and discussions with colleagues knowledgeable about HF self-care in the Australian population. An audit trail of process and analytic memos and coding books was maintained to support the credibility of the study (Speziale & Carpenter, 2003).

Qualitative and quantitative analyses were performed by separate investigators (BR and VVD) who were blinded to the other's results. Once the individual analyses were completed, they integrated the results using methods of triangulation (Greene, Caracelli, & Graham, 1989).

Results

We enrolled 40 persons and 29 completed the 6MWT and quantitative surveys. Of these 29, 27 completed the qualitative interview. Eleven who agreed to participate failed to do so for these reasons: (1) six reported ill health or a change in their health that precluded participation; (2) two were unable to be contacted after signing the consent; and (3) three withdrew before the consent was signed. The 11 who withdrew were more likely to be female and NYHA class II than the 29 who completed the study.

The final sample of 29 was primarily male, married, born in Australia, educated at the secondary (high school) level, and retired. Most had systolic HF and few comorbid illnesses. Most were only mildly symptomatic (NYHA functional class II). Arterial oxygen saturation (SaO_2) ranged from 93 to 100 prior to the 6MWT, dipping to 89 in one person and 90 in another immediately after the 6MWT. The time since being diagnosed with HF ranged from eight months to 23 years. Ages ranged from 35 to 94 years. After sorting patients into older and younger age groups, the only significant difference between the groups was the proportion retired, which was higher in the older sample (Table 1).

When ratings of SOB on the Borg scale were coded as consistent with or different than the RNRA rating and compared by age group, a pretest rating discrepancy was more likely for those older (66.7%) than those younger (33.3%). Similar results were obtained immediately after the 6MWT, with the older group (71.4%) having more discrepancy between ratings than the younger group (28.6%). Similar results were obtained five minutes after the 6MWT, with the older group (61.5%) having more discrepancy between the ratings than the younger group (38.5%). The only discrepancy that was statistically significantly different between older and younger participants was that obtained immediately after the 6MWT (Figure 1).

Qualitative Data

In the qualitative data there was a clear age-related difference in symptom detection and interpretation ability, which was reflected in two key themes. The overarching theme was that the subtle symptoms commonly associated with HF (e.g., breathlessness, fluid retention and fatigue) were not readily detected by the older patients or interpreted as evidence of an exacerbation of HF. A common interpretation by the older patients was that their symptoms were related to comorbid conditions (e.g., ankle edema was interpreted as "*probably the arthritis*") or being out of shape (the meaning of breathlessness was "*just a lack of exercise, I guess*").

Fatigue was commonly reported by the older sample but only interpreted as a symptom of HF by a few. Rather, fatigue was related to a poor night's sleep or too much activity. Even when fatigue occurred along with symptoms of breathlessness, chest pain or weight gain, "*bludging*" (an Australian expression for feeling lazy or lacking energy) was not readily linked to HF among those in the older sample.

Few older patients detected breathlessness without the support of others (*my wife sees it…says 'you're looking a little gray'…*). One woman who was 85 years old became short of breath during the interview but failed to detect her labored breathing until the interviewer pointed it out. Older patients who did detect symptoms of fluid retention (e.g., weight gain, nocturnal dyspnea) often received help in interpreting their symptoms by calling their healthcare providers (*ring up the nurse*).

A key difference between the older and the younger HF patients was the ability of the younger ones to detect early, subtle cues of HF and interpret the meaning of worsening symptoms in order to avert a HF exacerbation. For example, one 52 year old female recalled an episode of worsening symptoms: *"...the swelling came up in my feet... at first, it wasn't difficult <to put my shoes on>, but it was there… then the weight increased and I did not feel comfortable...<when this happens> I realized I did something which triggered something off…*". Most of the participants under age 73 reported fatigue as an early HF symptom and described how they discerned the reasons for fatigue *(tiredness when I feel bloating, that's the fluid…*). For the younger group, changes in energy level were important cues that, when linked to other symptoms like weight gain, were interpreted as evidence of HF exacerbation. Younger HF patients were more adept at making these links without consulting their healthcare provider.

A second important theme that emerged from this comparison of the two age groups was a difference in perceived health. Younger HF patients reported the negative effects of HF symptoms on their daily routines *(It (HF) has affected every part of my life…it has affected my sleep… there are so many things I can't do anymore…things with the family now I cannot do…*). These effects seemed to improve their ability to detect and interpret HF symptoms through hypervigilance (*I think about it (HF) all the time…*). Conversely, older patients perceived their health more favorably (*I feel terrific...I don't have many bad days…I get up in the morning…I just know it's going to be a good day*). The disadvantage of this positive health perception was less vigilance *(I just accept it…I don't worry about myself… I just take it as it comes...my health included*), which may contribute to poorer detection and interpretation of HF symptoms.

Although there were no consistent themes related to BMI, several of those with a BMI >25 interpreted HF symptoms as "getting fat". These were older HF patients so the contribution of BMI could not be differentiated from age in the qualitative analysis.

Integration of Quantitative and Qualitative Data

The integrated data confirmed that older patients had more errors in detecting symptoms than the younger patients. There was 92% concordance of the quantitative and qualitative data when each individual's data was compared with his or her narrative account of symptoms and self-care practices. Older patients with a discrepancy between what they perceived and what the RNRA noted reported in the narrative accounts that either they did not experience SOB or, when they did, they attributed it to a cause unrelated to HF. For example, one 73 year old man who was rated higher on the Borg scale by the RNRA before and after the 6MWT reported that he felt "*chest pain from walking too fast, not shortness of breath*".

Almost one third (31%) of those who erred in detecting SOB after the 6MWT reported that their spouse or friends recognize their symptoms prior to their own detection. Conversely, heightened symptom vigilance (*it <HF> is always there…*) emerged as a common theme among the few younger HF patients who rated their SOB greater than the RNRA rated it.

When the qualitative data were reexamined in light of the symptom detection discrepancy data, two particular difficulties faced by HF patients interpreting their symptoms were identified. For older HF patients, uncertainty as to the interpretation of SOB (*I guess it could be the heart….)* was associated with detection errors. A need for more information about HF symptoms (*I want to know….what is doing this?*) emerged as a theme among the younger patients who recognized symptoms but had difficulty interpreting their meaning.

Discussion

Age-related differences in symptom detection and interpretation ability were found in both the quantitative and the qualitative data collected for this study. The older patients were about twice as likely as the younger ones to report either more or less SOB than that noted by the RNRA. The discrepancy was most pronounced immediately after SOB was stimulated with the 6MWT. These results support our theory of poor interoception as a cause of failure to detect early HF symptoms. Poor interoception in HF may reflect an inability to perceive symptoms because of a loss of cortical regions of the brain such as the insula and anterior cingulate (Woo, Macey, Fonarow, Hamilton, & Harper, 2003) that are responsible for detecting the interior state of the body by monitoring firing rates of sensory neurons monitoring the lungs and other organs (Critchley, Melmed, Featherstone, Mathias, & Dolan, 2002).

Vigilance also may help to explain the age-related difference in symptom detection ability. The older sample was not vigilant about monitoring their symptoms, expecting some level of disability at their age, while the younger sample was focused on what HF had robbed from them. The younger patients were more distressed by having HF, perhaps because of the activity restrictions, which decreased their satisfaction with their health. These results support those of Watson and Pennebaker (1989) who hypothesized that distress about a health problem affects symptom perception ability. They proposed that individuals with negative affectivity may have heightened attention to internal physical symptoms, or interoception, and therefore may be more likely to complain about a symptom when it occurs. A second explanation they posited was that the increased distress may actually exaggerate the perception of the symptom. Similarly, Westlake, Dracup, Creaser, Livingston, Heywood, Huiskes et al. (2002) suggested that HF patients with neuroticism, the tendency to be worried or anxious, may be dissatisfied with their health and may report poor health. In this study, younger HF patients who were more distressed about their health were more attentive to their symptoms. As a result, they detected early, subtle cues more accurately than older patients.

In addition to impaired symptom detection ability, the older patients in this study commonly interpreted their symptoms as something other than HF (e.g., a comorbid condition, being out of shape). These results support those of Stoller and colleagues (1993) who found, in a study of 667 elders living in the community, that one in eight discounted potentially serious symptoms. They also lend support to those of Soiza et al. (Soiza, Leslie, Harrild, Peden, & Hargreaves, 2005) who found that older patients with suspected acute coronary syndrome were more likely to have atypical symptoms than their younger counterparts.

Uncertainty about symptoms was most pronounced in the older sample, as others have found. For example, Winters (1999) identified age related changes in the ability to recognize and respond to HF symptoms and attributed this inability to uncertainty. In another study of cardiac cue sensitivity, Miller (2000) described a process of cue apprehension, cue assimilation, and medical consultation in women with cardiac disease; cues were signs, symptoms, or self risk appraisal. The decision to discount or attend to cues depended on the nature, intensity, and specificity of the cue as well as knowledge and experience with cardiac disease and validation with others. In this study, no gender-specific themes emerged in the qualitative analysis of symptom detection and interpretation. But, this may reflect a sample bias as the 11 who withdrew were more likely to be female.

The results of this study suggests the need to develop interventions that focus on the symptom experience to help patients—particularly older ones—in somatic awareness and symptom interpretation. It may be useful to explore patients' statements about how they feel: "Compared to what? How do you feel today compared to yesterday?" These types of question may help to discern if patients are aware of their symptoms or ignoring them because of misinterpretation or age-related expectations. As caregivers were vital in terms of augmenting the abilities of older HF patients to detect and interpret their symptoms, caregivers should be targeted for health education. Older patients without caregiver support might be at greater risk of readmission, as they tend to be are less vigilant at symptom monitoring and do not have a caregiver to observe symptom changes.

Limitations of this study include the cross sectional nature of the study. The significance of symptom recognition at one point in time may differ across symptom experiences. The pattern of symptoms may influence the interpretation of symptoms. Also, since some interviews took place at a secondary session, recall and interpretation of symptoms during the 6MWT could have diminished.

In summary, in this study we documented an age-related inability to detect shortness of breath. Poor symptom interpretation was also found in the older HF patients. Several possible interpretations for poor interpretation ability in older patients were proposed: 1) gray matter losses in the cortical lesions responsible for symptom perception; 2) less vigilance regarding symptoms; 3) lack of distress over health changes; 4) uncertainty; and 5) attributing symptoms to less threatening causes such as aging or comorbid illnesses. Further research is needed to identify why persons with HF do not detect and act upon their early symptoms.

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Table 1. Demographic and Clinical Characteristics of the Enrolled Sample, Displayed by Age Categories

	Younger (<73 years) Sample (n=13)	Older (≥73 years) Sample (n=16)	Total (n=29)
	Mean ± Standard deviation	Mean ± Standard deviation	Mean ± Standard deviation
Age in years	55.9 ± 11.2	79.1 ± 5.5	68.7 ± 14.4
Body mass index	26.7 ± 3.9	27.1 ± 6.3	26.9 ± 5.3
Arterial oxygen saturation	97.1 ± 1.6	96.6 ± 1.6	96.8 ± 1.6
Charlson comorbidity score	.5 ± 1.8	3.2 ± 1.8	2.9 ± 1.8
Years with HF	3.9 ± 4.5	6.2 ± 6.7	5.2 ± 5.8
Ejection fraction	27.6 ± 12.8	29.0 ± 8.6	28.3 ± 10.7
NT-ProBNP level	1459 ± 1191 pg/ml	1642.0 ± 1083.6 pg/ml	1557 ± 1117 pg/ml
	Frequency (%)	Frequency (%)	Frequency (%)
Male	10 (76.9%)	11 (68.8%)	21 (72.4%)
Married	8 (61.5%)	10 (62.5%)	18 (62.1%)
Confidant available	10 (76.9%)	15 (93.8%)	25 (86.2%)
Born in Australia	6 (46.2%)	10 (62.5%)	16 (55.2%)
Highest education			

-High School -University	3 (23.1%) 4 (30.8%)	10 (62.5%) 2 (12.5%)	13 (44.8%) 6 (20.7%)
Retired, not due to HF	3 (23.1%)	14 (87.5%)*	17 (58.6%)
Financially have enough to make ends meet	8 (61.5%)	10 (62.5%)	18 (62.1%)
Low level of comorbid illnesses	9 (69.2%)	8 (50.0%)	17 (58.6%)
NYHA class II	9 (69.2%)	8 (50.0%)	17 (58.6%)
Perceived health -good -fair	 5 (38.5%) 6 (46.2%)	 7 (43.8%) 4 (25%)	 12 (41.4%) 10 (34.5%)

* p<.10; NYHA=New York Heart Association; HF=heart failure

Table 2. Exercise Capacity in the Enrolled Sample, Displayed by Age Categories

	Younger (<73 years) Sample (n=13)	Older (≥73 years) Sample (n=16)	Total (n=29)
	Mean ± Standard deviation	Mean ± Standard deviation	Mean ± Standard deviation
Reports having exercised ≥1 hour last week	10 (76.9%)	5 (31.3%)*	15 (51.7%)
Distance walked in 6MWT	456.0 ± 148.0 meters	338.8 ± 164.9 meters*	391.3 ± 165.7 meters
Borg Rating of Perceived Exertion before 6MWT	.42 ± .64	.94 ± 1.7	.71 ± .99
VAS Rating of Perceived Exertion before 6MWT	7.1 ± 15.4	12.1 ± 15.4	9.8 ± 15.3
Borg Rating of Perceived Exertion immediately after 6MWT	2.7 ± .85	3.6 ± 1.8*	3.2 ± 1.5
VAS Rating of Perceived Exertion immediately after 6MWT	31.1 ± 15.6	39.6 ± 21.0	35.8 ± 18.9
Borg Rating of Perceived Exertion 5 minutes after 6MWT	.85 ± 1.1	1.2 ± 1.7	1.1 ± 1.4
VAS Rating of Perceived Exertion 5 minutes after 6MWT	10.1 ± 16.6	12.2 ± 12.4	11.3 ± 14.2

* $p<.10$; VAS=visual analogue scale; 6MWT=6 minute walk test

Figure 1. Scatter Plot Illustrating the Age-Related Variability in Scores on the Borg Measure of Perceived Exertion

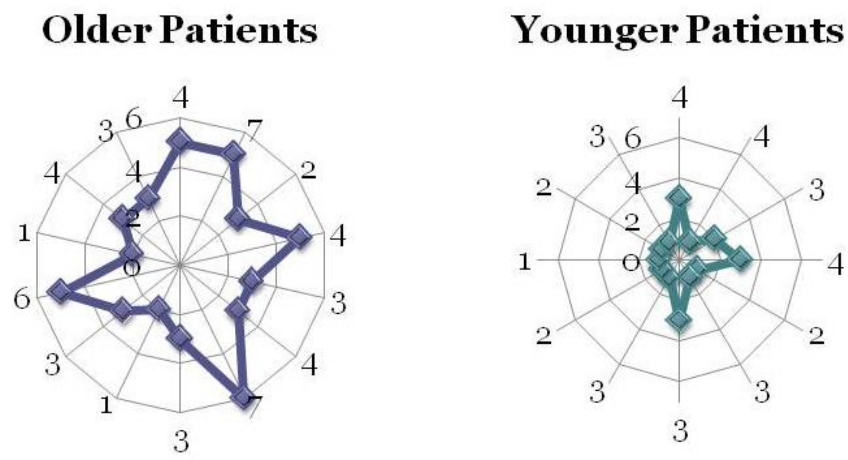

Figure Legend: Immediately after the 6-minute walk test both the heart failure patient and the registered nurse research assistant rated the patient’s shortness of breath on the Borg Measure of Perceived Exertion, a 0-10 rating scale. The discrepancy between the two ratings was calculated and plotted here by age group. As shown on the left, more variability in ratings between the patient and research assistant was found in older persons (≥73 years) compared with younger (<73 years) persons.

Clinical Resources

1. American Heart Association, HeartHub for patients: http://www.hearthub.org/hc-heart-failure.htm
2. Heart Failure Society of America, education modules: http://www.hfsa.org/heart_failure_education_modules.asp
3. European Society of Cardiology, Heart Failure Association, Heart Failure Matters: http://www.heartfailurematters.org/English_Lang/Pages/index.aspx