Outpatient Cardiology Practices With Advanced Practice Nurses and Physician Assistants Provide Similar Delivery of Recommended Therapies (Findings from IMPROVE HF)

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National guidelines recommend a team model of care to facilitate adherence to evidence-based practices; however, previous studies suggesting benefit may have limited generalizability. The aim of this study was to examine the influence of advanced practice nurse (APN) and physician assistant (PA) staffing on the delivery of guideline-recommended therapies for outpatients with heart failure (HF). The Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the Outpatient Setting (IMPROVE HF), a prospective cohort study, enrolled 167 cardiology practices to characterize outpatient management of 15,381 patients with chronic HF and left ventricular ejection fractions ≤35%. Adherence to guideline-recommended HF therapies was recorded, and the presence of APN and PA staffing was assessed by survey. Multivariate models identified contributions to the delivery of guideline-recommended HF therapies. Of cardiology outpatient practices, 66.0% had APNs and PAs. Practices with 0, >0 to <2, and ≥2.0 APN and PA staffing had similar adherence to the 7 guideline-recommended HF therapies. After adjustment, staffing with ≥2 APNs or PAs was associated with greater conformity with 2 of 7 measures (implantable cardioverter-defibrillator therapy and delivery of HF education, p ≤0.01 for both) and similar conformity to angiotensin-converting enzyme inhibitor or angiotensin receptor blocker therapy, β-blocker therapy, aldosterone antagonist therapy, anticoagulation for atrial fibrillation, and cardiac resynchronization therapy. In conclusion, staffing with APNs and PAs varied in cardiology outpatient practices. Compared to no APNs or PAs, ≥2.0 APNs or PAs per cardiology practice was associated with the greater use of implantable cardioverter-defibrillator therapy and delivery of HF education and equivalent use of drug and cardiac resynchronization therapies. **(Am J Cardiol 2010;105:1773–1779)**

National heart failure (HF) guidelines recommend a team model of care for all patients who are at high risk for hospital admission or who have clinical deterioration as a means to provide education, manage chronic symptoms, and facilitate the implementation of evidence-based practices.[1] In American studies, a team model of care most often involved nurse-led clinics that were carried out by nurses with advanced practice nurse (APN) credentials;[2–5] however, physician assistant (PA) services have also been used in managing ambulatory patients with HF.[6] In American nurse-managed clinics, emphasis was placed on reporting patient functioning[7] and hospitalization rates[2,7] and financial outcomes.[2–4] Relatively little is known about the effectiveness of HF-devoted APNs and PAs on the delivery of recommended HF therapies in outpatient cardiology practices beyond artificial research settings, in which APNs and PAs are more likely to be highly trained and experienced in managing HF and in which they work closely with cardiologists who are also HF specialty trained. Thus, the objective of this study was to examine the influence of APN and PA staffing on the delivery of guideline-recommended therapies for patients with HF in outpatient cardiology practices.

Methods

The Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the Outpatient Setting (IMPROVE HF) is a

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The Registry to Improve the Use of Evidence-Based Heart Failure Therapies in the Outpatient Setting (IMPROVE HF) and this study are sponsored by Medtronic, Inc., Minneapolis, Minnesota.

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0002-9149/10/$ – see front matter
doi:10.1016/j.amjcard.2010.01.360

Table 1
Baseline patient characteristics by level of advanced practice nurse and physician assistant staffing (n = 14,891)

Characteristic	APN/PA Staffing Level			p Values			
	0 (n = 4,381)	>0 to <2 (n = 4,394)	≥2 (n = 6,116)	Overall	0 vs >0 to <2	0 vs ≥2	>0 to <2 vs ≥2
Age (years)	68.9 ± 13.2	68.4 ± 13.3	68.6 ± 13.2	0.099	0.033	0.192	0.307
Men	71.2%	70.4%	71.9%	0.265	0.404	0.468	0.103
Race							
White	38.9%	45.0%	40.5%	0.005	0.483	0.077	<0.001
African American	8.8%	10.8%	7.8%				
Not documented or missing	50.5%	42.5%	50.0%				
Ischemic cause of HF	67.2%	65.7%	63.6%	<0.001	0.217	<0.001	<0.001
Previous atrial fibrillation	29.7%	29.9%	32.2%	0.007	0.868	0.006	0.010
Diabetes mellitus	33.7%	34.8%	33.2%	0.200	0.256	0.581	0.075
Hypertension	63.0%	63.1%	59.8%	<0.001	0.933	<0.001	<0.001
Previous myocardial infarction	39.1%	39.3%	39.6%	0.875	0.863	0.614	0.751
Chronic obstructive pulmonary disease	16.7%	17.4%	15.6%	0.043	0.398	0.125	0.014
Previous coronary bypass	31.5%	31.2%	30.3%	0.395	0.799	0.206	0.322
Peripheral vascular disease	12.6%	11.7%	10.3%	<0.001	0.195	<0.001	0.023
Depression	7.6%	8.7%	9.7%	0.001	0.052	<0.001	0.107
Left ventricular ejection fraction	25.7 ± 6.9%	25.6 ± 6.9%	25.2 ± 7.1%	0.008	0.802	0.006	0.013
Systolic blood pressure (mm Hg)	121.2 ± 18.6	120.5 ± 19.0	119.9 ± 18.9	0.001	0.030	<0.001	0.216
Diastolic blood pressure (mm Hg)	70.7 ± 11.1	70.2 ± 11.5	70.2 ± 11.2	0.012	0.004	0.025	0.374
Heart rate at rest (beats/min)	72.0 ± 11.7	72.5 ± 11.4	71.8 ± 11.5	0.010	0.016	0.806	0.005
Rales on most recent examination	3.1%	4.1%	3.8%	<0.001	<0.001	<0.001	0.646
Edema on most recent examination	19.7%	20.5%	19.3%	0.012	0.175	0.288	0.002
Sodium (mEq/L)	139.3 ± 3.9	139.0 ± 4.0	139.3 ± 4.5	<0.001	<0.001	0.616	<0.001
Blood urea nitrogen (mg/dl)	25.1 ± 13.8	26.0 ± 15.7	26.0 ± 15.0	0.036	0.247	0.010	0.184
Creatinine (mg/dl)	1.4 ± 0.7	1.4 ± 0.9	1.4 ± 0.8	0.157	0.085	0.817	0.103
Potassium (mEq/L)	4.5 ± 2.99	4.4 ± 0.99	4.5 ± 1.58	<0.001	0.001	0.961	<0.001
B-type natriuretic peptide (pg/ml)	992 ± 881	1,567 ± 713	1,537 ± 730	0.021	0.271	0.07	0.069
QRS duration (ms)	128.4 ± 37.9	127.9 ± 40.7	130.4 ± 41.1	0.186	0.491	0.072	0.274
NYHA functional class				<0.001	<0.001	<0.001	<0.001
I and II	73.5%	65.7%	68.4%				
III and IV	26.5%	34.3%	31.6%				

Data are expressed as mean ± SD or as percentages.
NYHA = New York Heart Association.

prospective, longitudinal cohort study designed to characterize the current management of patients with chronic HF or previous myocardial infarctions and left ventricular systolic dysfunction in outpatient cardiology practice settings. The overall study objectives, design, and methods, including definitions of 7 process measures, were described in detail previously.[8,9] The analyses examining effect of APN and PA staffing on the delivery of guideline-recommended therapies for HF was prespecified in the study protocol. Those who were invited to participate in IMPROVE HF were from community-based practices with no academic affiliations, academically affiliated university settings, and nonuniversity settings with single-specialty or multispecialty cardiology outpatient practices from all regions of the United States.[9] Chronicity of HF was assessed by physician documentation on ≥2 separate visits for HF treatment in the current practice setting during the 2-year period preceding study initiation. Left ventricular systolic dysfunction was confirmed by a quantitative left ventricular ejection fraction ≤35% measured by the most recent echocardiographic study, nuclear multiple gated acquisition scan, contrast ventriculographic study, or magnetic resonance imaging scan or a qualitative assessment of left ventricular function indicative of moderate to severe dysfunction with stage C HF or post–myocardial infarction without HF (stage B).

In this analysis, we used baseline data collected from medical chart reviews and entered into the IMPROVE HF registry from late 2005 through early 2007. Data were collected using a standardized case report form. Documented contraindications, intolerance, or economic, social, religious, refusal, or nonadherence reasons for not prescribing evidence-based HF therapies were also collected and used in patient eligibility for inclusion of quality improvement measures. The most recent electrocardiographic computerized reading or physician measurement was used to obtain QRS duration. During baseline assessment, a median of 90 patients with HF from each practice (interquartile range 58 to 107) were included, providing a representative sample of patients per practice.[9]

Practice characteristics were collected by survey at baseline and included the number of APNs (defined as nurse practitioners or clinical nurse specialists) or PAs dedicated to HF management; geographic location; practice type; the numbers of cardiologists, electrophysiologists, and non-APN nurse clinicians; affiliation with a