

## Supplemental Material

### Supplemental Methods:

#### Statistical Analysis

Descriptive statistics of the baseline clinical characteristics are presented as mean  $\pm$  standard deviation (SD) for continuous variables, median (interquartile range (IQR)) for ordinal variables, and frequency for categorical variables. Baseline characteristics were stratified by presence of PH on right heart catheterization (RHC) (PH by RHC group, mean PAP $\geq$ 25mmHg), absence of PH on right heart catheterization (No PH by RHC group, mean PAP $<$ 25mmHg), and by patients who did not undergo or had a technically inadequate RHC without measurement of mean PAP (Unknown PH status group). The baseline characteristics of the PH by RHC group were compared to the No PH by RHC group, using Kruskal-Wallis testing for continuous variables and chi-square testing for categorical variables. The association between baseline characteristics that were significantly different in the PH by RHC and No PH by RHC groups and PH was further assessed using univariate logistic regression. The RHC hemodynamics were described in the PH by RHC and No PH by RHC groups. Kruskal-Wallis testing or chi-square testing was performed as appropriate to assess differences in hemodynamic values between the two groups, not including the mean PAP, which was different by definition.

Adequacy of PH workup was described as the frequency with which guideline appropriate testing, including echocardiography, assessment of left ventricular function; ANA; liver function tests; HIV serologies; pulmonary function testing; chest imaging; V/Q scan and/or

chest CT angiography; sleep testing or overnight oximetry were performed in patients confirmed to have pulmonary hypertension<sup>8</sup>.

Actual survival from time of first clinic visit was assessed through the final follow up date of 5/31/2016, and time to death for patients who died was calculated; 1-year mortality from time of first clinic visit was calculated. A Kaplan-Meier survival curve for patients with confirmed PH by RHC was drawn.

Changes in treatment and functional status for patients with at least one follow up visit after initial clinic visit were described. Prescription for new or changes in existing supportive medications and other treatments (loop diuretics, including dosage in furosemide equivalents; warfarin; digoxin; PAH-specific therapies; oxygen; CPAP or other noninvasive ventilation), as well as changes in mMRC dyspnea scale, six-minute walk testing, and functional status from first visit to most recent clinic visit (through 5/31/2016) are presented. A follow up visit was defined as a return visit to PH clinic and/or a visit for RHC. Furosemide equivalents were defined as follows: 40mg furosemide=1mg bumetanide=20mg torsemide=50mg ethacrynic acid. Paired t-test for continuous variables, Wilcoxon signed ranks sums test for ordinal variables, or McNemar's chi-square testing for categorical variables was performed as appropriate to assess for changes in these characteristics between the first and most recent follow up visit.

All analysis was performed using Stata/SE version 11.2 software (StataCorp LP). A 2-sided p value of less than 0.05 was considered significant.

## Supplemental Results:

### The Multispecialty Pulmonary Hypertension Clinic

Prior to institution of the clinic, educational sessions about PH and PH clinic referral were undertaken with various groups within the medical center. The multispecialty PH clinic is staffed by an attending cardiologist and attending pulmonologist with interests in PH clinical care and research. Patients are referred to the clinic by placing a consultation request in the electronic medical record system. Trainees are regularly present in the clinic, including preventive cardiology fellows, pharmacy residents and students. The trainees typically perform the initial assessment of new patients, using a templated note to capture essential data needed for the diagnostic assessment of possible PH. Patients are then jointly discussed with the clinic attending staff, data is reviewed, and a diagnostic and/or care plan established. Patients are then seen and examined by the PH team and, after assessment, the recommendations for further testing or treatment are discussed with the patient. Right heart catheterizations are typically performed in the outpatient setting by the PH cardiologist and cardiology fellow in the catheterization suite, and catheterization results reviewed jointly by the PH attending team. Patients with catheter-confirmed PH return to the PH clinic for follow up; patients are also referred as appropriate for further care in related care settings such as the heart failure clinic or pulmonary rehabilitation program.

Supplemental Table 1: Baseline characteristics in patients undergoing right heart catheterization, with p values for comparisons (Kruskall-Wallis for continuous and chi-square for categorical variables)

	<b>Patients with confirmed PH by right heart catheterization</b> (n=73)	<b>Patients without PH by right heart catheterization</b> (n= 21)	P value for comparison
Age	72.8 (9.0)	73 (11.3)	0.679
Male sex	68/73 (93.2%)	21/21 (100%)	0.218
<b>BMI (kg/m2)</b>	<b>34.3 (8.3)</b>	<b>29.3 (5.6)</b>	<b>0.012</b>
AHA ideal health (BMI<25)	10/73 (13.7%)	3/21 (14.3%)	0.446
AHA intermediate health (BMI≥25, <30)	18/73 (24.7%)	8/21 (38.1%)	
AHA poor health (BMI ≥30)	45/73 (61.6%)	10/21 (47.6%)	
Heart rate (bpm)	76 (14)	76 (9)	0.952
<b>Systolic blood pressure (mmHg)</b>	<b>126 (18)</b>	<b>113 (13)</b>	<b>0.003</b>

Diastolic blood pressure (mmHg)	71 (9)	69 (8)	0.222
<b>Pulse pressure (mmHg)</b>	<b>55 (15)</b>	<b>44 (11)</b>	<b>0.001</b>
Oxyhemoglobin saturation (%)	94 (4) (n=70)	96 (2)	0.147
<b>mMRC dyspnea score, initial visit</b>	<b>3 (2, 3)* (n=72)</b>	<b>2 (1.5, 3)* (n=20)</b>	<b>0.034</b>
mMRC dyspnea score 0	2/72 (2.8%)	2/20 (10.0%)	0.27
mMRC dyspnea score 1	6/72 (8.3%)	3/20 (15.0%)	
mMRC dyspnea score 2	17/72 (23.6%)	6/20 (30.0%)	
mMRC dyspnea score 3	32/72 (44.4%)	8/20 (40.0%)	
mMRC dyspnea score 4	15/72 (20.8%)	1/20 (5.0%)	
<b>NYHA functional class, initial visit</b>	<b>3 (2, 3)* (n=51)</b>	<b>2 (1, 2.5)* (n=12)</b>	<b>0.003</b>
<b>NYHA function</b>	<b>0/51 (0%)</b>	<b>0/12 (0%)</b>	<b>0.015</b>

<b>class 0</b>			
<b>NYHA functional class 1</b>	<b>3/51 (5.9%)</b>	<b>4/12 (33.3%)</b>	
<b>class 2</b>			
<b>NYHA functional class 2</b>	<b>14/51 (27.4%)</b>	<b>5/12 (41.7%)</b>	
<b>class 3</b>			
<b>NYHA functional class 3</b>	<b>27/51 (52.9%)</b>	<b>3/12 (25.0%)</b>	
<b>class 4</b>			
<b>NYHA functional class 4</b>	<b>7/51 (13.7%)</b>	<b>0/12 (0%)</b>	
Jugular venous distention, initial visit	25/73 (34.2%)	6/21 (28.6%)	0.626
Peripheral edema	40/73 (54.8%)	8/21 (38.1%)	0.177
History of anemia	25/73 (34.2%)	3/21 (14.3%)	0.078
History of congenital heart disease	2/73 (2.7%)	1/21 (4.8%)	0.642
History of valvular heart disease	15/73 (20.6%)	7/21 (33.3%)	0.223
History of diabetes	30/73 (41.1%)	8/21 (38.1%)	0.805

History of systemic hypertension	48/73 (65.8%)	12/21 (57.1%)	0.469
History of anorexigen use	5/73 (6.8%)	1/21 (4.8%)	0.730
History of bleeding disorder, GI bleeding, or epistaxis	16/73 (21.9%)	3/21 (14.3%)	0.443
History of cancer	25/73 (34.2%)	6/21 (28.6%)	0.626
History of heart failure	37/73 (51%)	7/21 (33.3%)	0.160
History of connective tissue disease	5/73 (6.8%)	4/21 (19%)	0.094
<b>History of coronary artery disease</b>	<b>43/73 (58.9%)</b>	<b>7/21 (33.3%)</b>	<b>0.038</b>
History of COPD	47/73 (64.4%)	9/21 (43%)	0.076
History of DVT/PE	12/73 (16.4%)	3/21 (14.3%)	0.812
History of heart	16/73 (21.9%)	4/21 (19%)	0.777

surgery/CABG			
History of HIV infection	0/73 (0%)	1/21 (4.8%)	0.061
History of liver disease	9/73 (12.3%)	2/21 (9.5%)	0.725
History of OSA	41/73 (56.2%)	9/21 (42.9%)	0.281
History of pulmonary fibrosis	8/73 (11.0%)	3/21 (14.3%)	0.676
History of rheumatic fever/heart disease	2/73 (2.7%)	0/21 (0%)	0.443
History of sickle cell trait or disease, or thalassemia	0/73 (0%)	0/21 (0%)	NA
History of thyroid disease	7/73 (9.6%)	1/21 (4.8%)	0.485
History of splenectomy	1/73 (1.4%)	0/21 (0%)	0.590



History of myeloproliferative disease	1/73 (1.4%)	0/21 (0%)	0.590
Ever smokers	66/73 (90.4%)	16/21 (76.2%)	0.085
Current smokers	16/73 (21.9%)	1/21 (4.8%)	0.136
Former smokers	50/73 (68.5%)	15/21 (71.4%)	
Never smokers	7/73 (9.6%)	5/21 (23.8%)	
Six minute walk distance (feet)	897 (281) (n=53)	1220 (458) (n=9)	0.058
Six minute walk distance (meters)	306 (96) (n=53)	416 (156) (n=9)	0.058
<b>Forced expiratory volume in one second (FEV1), %</b>	<b>65 (21)</b> <b>(n=69)</b>	<b>76 (20)</b> <b>(n=19)</b>	<b>0.028</b>
<b>Forced vital capacity (FVC), %</b>	<b>78 (19)</b> <b>(n=69)</b>	<b>89 (17)</b> <b>(n=19)</b>	<b>0.022</b>
FEV1/FVC ratio	61 (14) (n=69)	64 (18) (n=19)	0.310
<b>Total lung capacity (TLC), %</b>	<b>83 (16)</b> <b>(n=66)</b>	<b>94 (18)</b> <b>(n=18)</b>	<b>0.032</b>
<b>Diffusion capacity</b>	<b>48 (20)</b>	<b>61 (24)</b>	<b>0.039</b>

of the lungs for carbon monoxide, %	(n=66)	(n=19)	
Airflow obstruction (FEV/FVC<70%)	49/69 (71%)	10/19 (52.6%)	0.131
<b>Restriction (TLC&lt;80%)</b>	<b>28/66 (42%)</b>	<b>3/18 (16.7%)</b>	<b>0.045</b>
Mixed obstruction and restriction	14/66 (21.2%)	1/17 (5.6%)	0.124
Right atrial enlargement	41/73 (56.2%)	9/20 (45%)	0.375
Right ventricular hypertrophy	6/73 (8.2%)	0/20 (0%)	0.185
<b>Systolic septal flattening</b>	<b>19/73 (26%)</b>	<b>1/20 (5%)</b>	<b>0.043</b>
Tricuspid plane annular systolic excursion (cm)	1.9 (0.6) (n=63)	2.1 (0.6) (n=16)	0.258
Left atrial size volume index	29.8 (15.2) (n=61)	26.3 (9.5) (n=17)	0.483

Left ventricular ejection fraction (%)	56 (8) (n=73)	58 (4) (n=21)	0.312
Reduced left ventricular ejection fraction (<50%)	9/73 (12.3%)	0/21 (0%)	0.091
Left ventricular diastolic dysfunction present	25/73 (34.2%)	8/20 (40%)	0.634
Pericardial effusion present	3/73 (4.1%)	0/20 (0%)	0.357
Aortic stenosis	12/73 (16.4%)	1/20 (5%)	0.191
Aortic stenosis severity*	1 4/12 (33.3%) 2 2/12 (16.7%) 3 3/12 (25%) 4 0/12 (0%) 5 3/12 (25%)	1 0/1 (0%) 2 0/1 (0%) 3 1/1 (100%) 4 0/1 (0%) 5 0/1 (0%)	0.487
Aortic	24/73 (32.9%)	6/14 (30%)	0.807

regurgitation			
Aortic	1 21/24 (87.5%)	1 6/7 (85.7%)	0.782
regurgitation	2 2/24 (8.3%)	2 1/7 (14.3%)	
severity*	3 1/24 (4.2%)	3 0/7 (0%)	
Mitral stenosis	0/73 (0%)	0/20 (0%)	NA
Mitral stenosis	NA	NA	NA
severity			
Mitral	35/73 (48%)	10/20 (50%)	0.871
regurgitation			
Mitral	1 30/37 (81.1%)	1 9/10 (90%)	0.793
regurgitation	2 3/37 (8.1%)	2 0/10 (0%)	
severity*	3 2/37 (5.4%)	3 1/10 (10%)	
	4 1/37 (2.7%)	4 0/10 (0%)	
	5 1/37 (2.7%)	5 0/10 (0%)	
Tricuspid	52/73 (71.2%)	18/20 (90%)	0.085
regurgitation			
Tricuspid	1 31/53 (58.5%)	1 12/18 (66.7%)	0.412
regurgitation	2 3/53 (5.7%)	2 0/18 (0%)	
severity*	3 9/53 (17.0%)	3 2/18 (11.1%)	
	4 4/53 (7.6%)	4 0/18 (22.2%)	
	5 6/53 (11.3%)	5 4/18 (22.2%)	

Estimated right ventricular systolic pressure (mmHg)	49 (13) (n=56)	43 (10) (n=15)	0.033
Estimated right ventricular systolic pressure $\geq 40$ mmHg	49/56 (87.5%)	9/15 (60.0%)	0.014
Estimated right ventricular systolic pressure $\geq 60$ mmHg	16/56 (28.6%)	0/15 (0%)	0.019

\*1=mild; 2=mild to moderate; 3=moderate; 4=moderate to severe; 5=severe

Supplemental Table 2: Changes in treatments and functional factors over time in patients with confirmed PH

	At baseline PH clinic visit	At most recent follow up visit	p value
Loop diuretic prescription	42/68	57/68	0.0001**
Loop diurectic dosage (furosemide equivalents): mean (SD)	41 (53)	66 (59)	<0.001
Change in furosemide dose: mean (SD)	Mean increase of 24 (32)		
Warfarin prescription	20/68	22/68	0.41**
Digoxin prescription	3/68	4/68	0.56**
Pulmonary arterial	5/68	8/68*	0.41**

hypertension-specific therapy prescription			
Supplemental oxygen prescription	35/68	41/68	0.014**
CPAP prescription	28/68	38/68	0.004**
Weight in lbs: mean (SD)	224 (56) (n=68) 221 (56) (n=64 with follow up weight too)	218 (58) (n=64)	0.26
mMRC dyspnea score: median (IQR)	3 (2, 3) (n=67) 3 (2, 3) (n=57 with mMRC dyspnea score at recent visit)	3 (2, 3) (n=58) 3 (2, 3) (n=57 with mMRC dyspnea score at first visit)	0.037***
Functional classification: median (IQR)	3 (2, 3) (n=48) 3 (2, 3) (n=39 with NYHA class at recent visit)	3 (2, 3) (n=50) 3 (2, 3) (n=39 with NYHA class at first visit)	1.00 (NS)***

Six minute walk distance, feet	906 (278) (n=51) 908 (262) (n=26 with follow up 6MWD)	887 (355) (n=26)	0.65
Six minute walk distance, meters: mean (SD)	274 (86) (n=53) 277 (80) (n=26)	270 (108) (n=26)	

\*An additional 4/68 were actively enrolled in clinical trial of a PAH-specific therapy vs. placebo

\*\*McNemar test

\*\*\*Wilcoxon signed rank sum test

Paired t-test was performed to compare continuous variables.