

## Supplemental Material, Hassan *et al.*

### Supplemental Figure Legends:

**Supplemental Figure 1.** Intensive care unit (ICU) length of stay in patients with a planned admission for monitoring (PLAN) vs. those admitted for management of post-operative complications (UNPLAN). Median values indicated by black bar. \*\*\*\* =  $P$ -value < 0.001 for Wilcoxon rank-sum comparison of medians. LOS=Length of Stay

**Supplemental Figure 2.** ROC curves for multivariable logistic regression models that assess composite patient-level risk using a) the three-parameter non-invasive “low-risk focused” approach (Low-Risk (3)), b) the four-parameter invasive and non-invasive “low-risk focused” approach (Low-Risk (4)), and c) the “score and average” approach (Score & Avg).  $P$ -value for DeLong test. AUC=Area Under Curve

**Supplemental Figure 3.** ROC curves for logistic regression models including only patient-level risk (Pt-level), only procedural risk (Proc), or both patient-level and procedural risk (Pt-level + Proc) using a) the four-parameter invasive and non-invasive “low-risk focused” approach (Low-Risk (4)), and b) the “score and average” approach (Score & Avg). The area under the curve (AUC) for each model is shown in the legend.  $P$ -values are for DeLong test comparing ROC curves for each univariable model with the multivariable model.

**Supplemental Table 1** Risk stratification of the preoperative parameters used in the "score and average" approach

<b>Parameter</b>	<b>Low risk</b>	<b>Intermediate risk</b>	<b>High risk</b>
<b>WHO FC</b>	1 or 2	3	4
<b>6-MWD (m)</b>	>440	165 - 440	<165
<b>NT-proBNP (BNP) (ng/L)</b>	<300 (<50)	300 -1400 (50 - 300)	>1400 (>300)
<b>RAP (mmHg) on RHC</b>	<8	8.0 - 14	>14
<b>CI (L/min/m<sup>2</sup>)</b>	≥ 2.5	2 - 2.49	<2
<b>SvO<sub>2</sub> (%)</b>	>65	60 - 65	<60

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Definition of abbreviations: WHO FC=World Health Organization Functional Class; 6-MWD=6-Minute Walk Distance; NT pro-BNP=N-terminal prohormone Brain Natriuretic Peptide; BNP=Brain Natriuretic Peptide; RAP=Right Atrial Pressure; CI=Cardiac Index; SvO<sub>2</sub>=Mixed Venous Oxygen Saturation

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**Supplemental Table 2** Preoperative variables

		<b>N (%)</b>		<b>N (%)</b>
<b>WSPH Group (N = 150)</b>	Group I	78 (52.0)	IPAH	21 (26.9)
			Drug/Toxin-PAH	1 (1.3)
			CTD-PAH	37 (47.4)
			HIV-PAH	3 (3.6)
			Portal HTN-PAH	7 (9.0)
			CHD-PAH	6 (7.7)
			PVOD/PCH	2 (2.6)
			HHT-PAH	1 (1.3)
	Group II	23 (15.3)	HFrEF-PH	2 (8.7)
			HFpEF-PH	18 (78.3)
			Valvular-PH	3 (13.0)
	Group III	22 (14.7)	COPD-PH	1 (4.6)
			ILD-PH	21 (95.5)
	Group IV	15 (10)	CTEPH	15 (100)
	Group V	12 (8)	Hemolytic Anemia	4 (33.3)
MPD			1 (8.3)	
Sarcoidosis			4 (33.3)	
CKD/Dialysis			2 (16.7)	
High CO, cirrhosis			1 (8.3)	
<b>PAH-specific Therapy (N = 108)</b>	Monotherapy	59 (54.6)	PDE5I	43 (72.9)
			Riociguat	12 (20.3)
			ERA	4 (6.8)
	Combination Therapy	49 (45.4)	PDE5I + ERA	29 (59.2)
			PDE5I + inh PC	4 (8.2)
			PDE5I + IV/SQ PC	6 (12.2)
			ERA + inh PC	1 (2)
			ERA + IV/SQ PC	2 (4.1)
			PDE5I + ERA + inh PC	5 (10.2)
			PDE5I + ERA + IV/SQ PC	2 (4.1)
<b>ACC/AHA Procedural Risk (N = 150)</b>	Low	110 (73.3)	Endoscopic procedure	54 (49.1)
			Superficial procedure	16 (14.6)
			Cataract surgery	7 (6.4)
			Ambulatory surgery	33 (30)
	Elevated	40 (26.7)	Intraperitoneal surgery	17 (42.5)
			Orthopedic surgery	16 (40)
			Intrathoracic surgery	5 (12.5)
			Head and neck surgery	1 (2.5)
			Peripheral vascular surgery	1 (2.5)

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Definition of abbreviations: WSPH=World Symposium on Pulmonary Hypertension; IPAH=Idiopathic Pulmonary Arterial Hypertension; CTD=Connective Tissue Disease; HIV=Human Immunodeficiency Virus; HTN=Hypertension; CHD=Congenital Heart Disease; PVOD=Pulmonary Veno-Occlusive Disease; HHT= Hereditary Hemorrhagic Telangiectasia; PH=Pulmonary Hypertension; HFrEF=Heart Failure with reduced Ejection Fraction; HFpEF=Heart Failure with preserved Ejection Fraction; COPD=Chronic Obstructive Pulmonary Disease; ILD=Interstitial Lung Disease; CTEPH=Chronic Thromboembolic Pulmonary Hypertension; CKD=Chronic Kidney Disease; MPD = myeloproliferative disorder; CO=cardiac output; PDE5I=Phosphodiesterase-5 Inhibitor; ERA= Endothelin Receptor Antagonist; PC=Prostacyclin; IV/SQ=Intravenous/Subcutaneous; ACC/AHA=American College of Cardiology/American Heart Association

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**Supplemental Table 3** Endoscopic procedures

<b>Endoscopic Procedure</b>	<b>N (%)</b>
Colonoscopy	18 (33.3)
Esophagogastroduodenoscopy	14 (25.9)
Colonoscopy + Esophagogastroduodenoscopy	9 (16.7)
Endoscopic Retrograde Cholangiopancreatography	4 (7.4)
Enteroscopy	2 (3.7)
Bronchoscopy	2 (3.7)
Nasal endoscopy	2 (3.7)
Anoscopy	1 (1.9)
Cystoscopy	1 (1.9)
Colposcopy	1 (1.9)
Total	54 (100)

**Supplemental Table 4** Comparison of preoperative assessment data for patients who reached the primary outcome and those who did not

		Primary Outcome Reached		
		Yes (n = 19; 12.7%)	No (n = 131; 87.3%)	P-value
<b>WHO FC</b>	I	0 (0.0)	5 (4.0)	0.003
	II	2 (12.5)	52 (41.6)	
	III	12 (75.0)	68(54.4)	
	IV	2 (12.5)	0 (0.0)	
<b>NT-proBNP, ng/L*</b>		2184 [1010 – 5939]	588 [176 – 1899]	0.002
<b>NT-proBNP (BNP) range, ng/L</b>	<300 (<50)	2 (11.1)	46 (35.7)	0.01
	300 -1400 (50 - 300)	4 (22.2)	44 (34.1)	
	>1400 (>300)	12 (66.7)	39 (30.2)	
<b>Echocardiography</b>				
<b>RA Dilation</b>		15 (88.2)	83 (64.3)	0.05
<b>RV Dilation</b>	None	3 (16.7)	47 (36.4)	0.04
	Mild	5 (27.8)	40 (31.0)	
	Moderate	2 (11.1)	22 (17.1)	
	Severe	8 (44.4)	20 (15.5)	
<b>TAPSE, cm<sup>±</sup></b>		1.83 ± 0.62	1.85 ± 0.54	0.90
<b>Pericardial Effusion</b>		6 (35.3)	41 (32.0)	0.79
<b>Max TR Velocity, m/s<sup>±</sup></b>		3.86 ± 0.87	3.42 ± 0.71	0.06
<b>6-MWD, m<sup>±</sup></b>		289.1 ± 133.6	336.8 ± 119.4	0.22
<b>6-MWD Range, m</b>	> 440	2 (14.3)	24 (20.5)	0.65
	165 - 440	10 (71.4)	84 (71.8)	
	< 165	2 (14.3)	9 (7.7)	
<b>RHC</b>				
<b>RAP, mmHg<sup>±</sup></b>		8.7 ± 6.0	8.0 ± 5.3	0.62
<b>RAP Range, mmHg</b>	< 8	9 (47.4)	62 (49.6)	0.95
	8 - 14	8 (42.1)	48 (38.4)	
	> 14	2 (10.5)	15 (12.0)	
<b>CI, L/min/m<sup>2±</sup></b>		2.58 ± 1.06	2.66 ± 0.93	0.75
<b>CI range, L/min/m<sup>2</sup></b>	< 2	4 (22.2)	28 (23.5)	0.72
	2-2.5	6 (33.3)	29 (24.4)	
	> 2.5	8 (44.4)	62 (52.1)	
<b>SvO2, %<sup>±</sup></b>		64.1 ± 10.6	65.7 ± 8.9	0.58
<b>SvO2 Range, %</b>	< 60	4 (23.5)	24 (20)	0.47
	60-65	6 (35.3)	29 (24.2)	
	> 65	7 (41.2)	67 (55.8)	

\* Median [IQR] reported; the Wilcoxon rank-sum test used

<sup>±</sup> Mean ± SD reported; the independent t-test used

Definition of abbreviations: WHO FC=World Health Organization Functional Class; NT pro-BNP=N-terminal prohormone Brain Natriuretic Peptide; RA=Right Atrial; RAP=Right Atrial Pressure; RV=Right Ventricular; TAPSE=Tricuspid Annular Plane Systolic Excursion; TR= Tricuspid Regurgitant; 6-

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MWD=6-Minute Walk Distance; RHC= Right Heart Catheterization; CI=Cardiac Index; SvO2=Mixed Venous Oxygen Saturation

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Subject	Age	Sex	WSPH Group	WHO FC	6-MWD (m)	NT-proBNP (ng/L)	Procedure	ACC/AHA procedural risk	Cause of Death (POD)
1	28	F	4 (CTEPH)	Unknown	Unknown	517	Mediastinal Mass Excision	Elevated	CV compromise and Hypotension (4)
2	56	M	1 (CTD-PAH)	3	331	2204	Esophagogastroduodenoscopy	Low	RV failure (23)
3	55	F	1 (CTD-PAH)	4	Unknown	12263	Gastrojejunostomy Tube Insertion by IR	Low	Sepsis + stroke, cardiac arrest (5)
4	71	F	4 (CTEPH)	4	213	1865	Cardioversion with TEE	Low	Non-responsive Hypotension (16)
5	77	F	1 (CTD-PAH)	3	189	5939	Gastrojejunostomy Tube Insertion by IR	Low	Unclear* (25)
6	64	M	3 (ILD-PH)	3	280	2164	Open Inguinal Hernia Repair (SBO)	Elevated	Unclear* (13)
7	78	F	3 (ILD-PH)	3	180	1104	Left Shoulder Hardware Removal	Elevated	Unclear* (7)

\* Died after being discharged from the hospital - cause of death was unclear

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### Supplemental Table 5 Causes of death





**Supplemental Table 6** Reasons for 30-day hospital readmission

<b>Reason</b>	<b>Frequency</b>
RV Failure	5
Dyspnea	3
Symptomatic anemia	2
Nausea + vomiting	2
Abdominal fluid collection	1
Hypotension	1
Chest pain	1
Gastroparesis	1
SBO	1
Fever	1
Syncope	1

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Definition of abbreviations: RV=Right Ventricular; SBO= Small Bowel Obstruction

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