

## Percutaneous mechanical thrombectomy without lytics: The FlowTrievers System

Mitchell D. Weinberg, MD, MBA  
Chair, Department of Cardiology  
Staten Island University Hospital  
Northwell Health

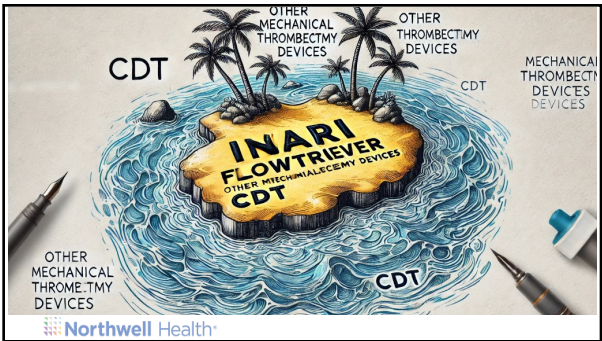
November 2024

**Staten Island University Hospital**  
Northwell Health

### Disclosures

- Boston Scientific
- Medtronic vascular
- Neptune Medical

**Northwell Health**



### Our Case

66-year-old female with uncontrolled htn, intermediate-high-risk PE

- HR 126 bpm, BP 100/48 , RR 31, O2 sat 89% on RA, 94% on 3L NC
- HsTrop: 175 (elevated), BNP 2500 (elevated)
- CT shows large, bilateral PE; RV/LV 1.4
- TTE shows large and hypercontractile RV. TAPSE 10 mm.
- Safely started on heparin gtt.
- Has-Bled score 2.

**Northwell Health**

### Mechanical thrombectomy with FlowTrievers

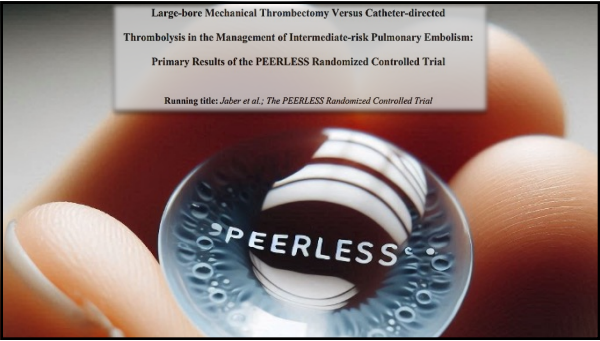
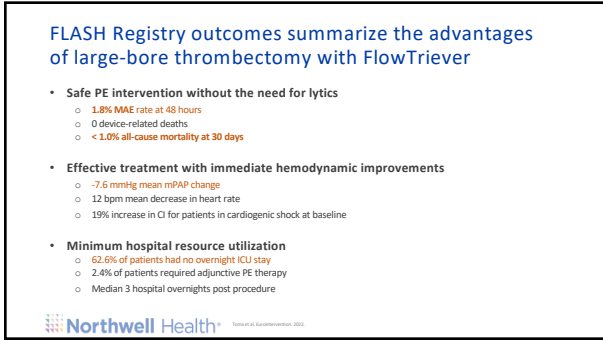
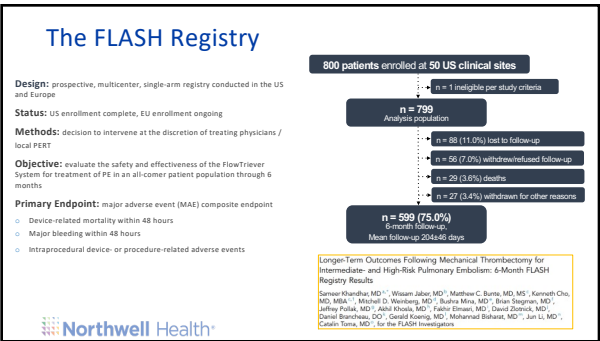
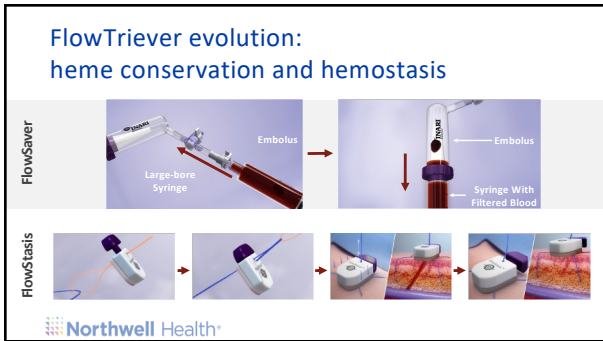
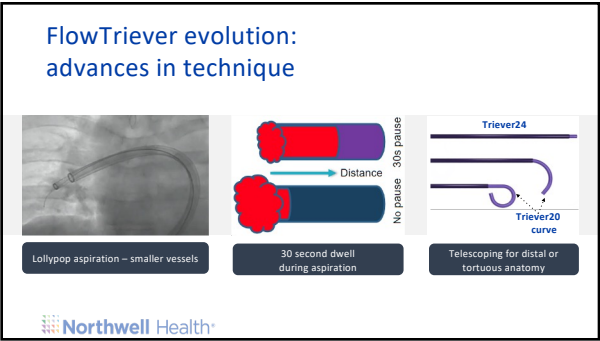
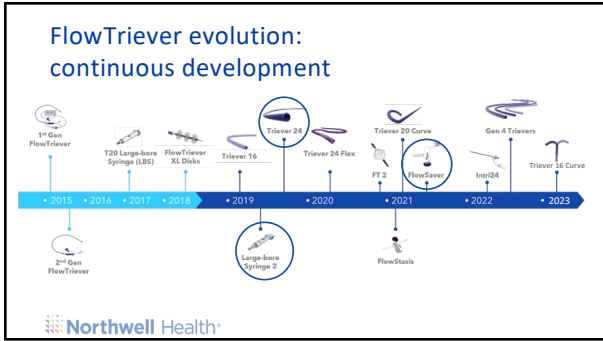
Triever24, Triever20, and Triever16      FlowSaver Blood Return System

The FlowTrievers System extracts PE by aspiration and/or mechanical modes

- Large-bore (16–24F) aspiration catheter
- Nitinol mesh disks for clot disruption
- FlowSaver for blood return

Device	Guide Wire	Outer Diameter	Inner Diameter	Effective Length
Triever24	0.035"	24 Fr (7.6 mm)	6.9 mm	90 cm
Triever20	0.035"	20 Fr (6.5 mm)	5.6 mm	90 cm
Triever16	0.035"	16 Fr (5.3 mm)	4.5 mm	107 cm

**Northwell Health**



### Flowtriever technique

	LBMT N=274	CDT N=276
<b>Right access site of study device<sup>1</sup></b>		
Common femoral or femoral vein	265 (96.7)	171 (62.0)
Jugular vein	0 (0.0)	97 (35.1)
Other	1 (0.4)	4 (1.4)
<b>Left access site of study device<sup>1</sup></b>		
Common femoral or femoral vein	9 (3.3)	25 (9.1)
Jugular vein	0 (0.0)	2 (0.7)
Other	0 (0.0)	1 (0.4)

	LBMT N=274	CDT N=276
<b>Performed quickly</b>		
Procedure time, minutes <sup>2</sup>	93.2 ± 36.1	65.3 ± 42.5
Fluoroscopy duration, minutes	21.5 ± 14.2	10.1 ± 6.6 <sup>2</sup>
Treatment catheter dwell time, minutes <sup>3</sup>	47.9 ± 27.2	915.7 ± 464.7



### High-Risk PE & Flowtriever

#### Outcomes in High-Risk Pulmonary Embolism Patients Undergoing FlowTriever Mechanical Thrombectomy or Other Contemporary Therapies: Results From the FLAME Study

Michael J. Steiner, DO, C. Michael Gibson, MD, Jay Garth, MD, MPH, Sameer Khandoo, MD, Wisam Jaber, MD, Catalin Toma, MD, Quirine Billa, MD, Tony Brown, MD, Lou Gravenor, MD, Herman Kishi, MD, David W. Zureick, MD, Mihai Oikarinen, MD, Aaron R. Ducif, MD, Paul Buhara, MD, James M. Horowitz, MD

**Original Research**

Mechanical Thrombectomy for High-Risk Pulmonary Embolism: Insights From the US Cohort of the FLASH Registry

James M. Horowitz, MD<sup>1</sup>, Wisam A. Jaber, MD<sup>2</sup>, Brian Stegman, MD<sup>3</sup>, Michael Rosenberg, MD<sup>4</sup>, Christina Fencak, MD, MSc<sup>5</sup>, Amberly P. Blah, MD<sup>6</sup>, Sreedevi Gondi, MD<sup>7</sup>, Jordan Castle, MD<sup>8</sup>, Mustafa Ahmed, MD<sup>9</sup>, Michael A. Brown, MD<sup>10</sup>, Robert Aron, MD<sup>11</sup>, Mohammed Bishara, MD<sup>12</sup>, Paul Barnes, MD<sup>13</sup>, Aaron DuCoffre, MD<sup>14</sup>, Michael Savin, MD<sup>15</sup>, Jeffrey S. Pollak, MD<sup>16</sup>, Mitchell D. Weisberg, MD, MBA<sup>17</sup>, Daniel Brancheau, DO<sup>18</sup>, Catalin Toma, MD<sup>19</sup>, for the FLASH Investigators

Flame: Circ Cardiovasc Interv. 2023. FLASH: High-risk sub-analysis. JSCAI 2024.



### Flowtriever and bleeding

- Does lose some blood. But less with blood return tools.

Estimated blood loss, mL	87.7 ± 87.6 <sup>1</sup>	144 ± 22.2 <sup>2</sup>
Blood return used	239 (87.2)	---
Estimated blood loss with blood return, mL	79.7 ± 76.1 <sup>1</sup>	---
Estimated blood loss without blood return, mL	149.8 ± 136.3 <sup>1</sup>	---
Estimated residual thrombus in treated vessels, % <sup>3</sup>	16.2 ± 15.7	29.6 ± 29.3

- Fatal Bleeds: None
- Critical organ bleeds: 2 ICH ~0.7%. Adjudicated as related to AC
- Major bleeding:
  - PEERLESS: 6.9%. 19 pts w major bleeds (~50% from vascular access site, CDT 62% of major bleeds from groin. ).
  - FLASH: 1.4% major bleeding.



### Flowtriever well-tolerated and quick recovery

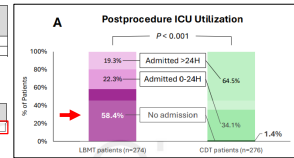
#### Appears well tolerated and effective

	LBMT N=274	CDT N=276
Clinical deterioration and/or escalation to bailout	5 (1.8)	15 (5.4)
Patients with clinical deterioration	4 (1.5)	10 (3.6)

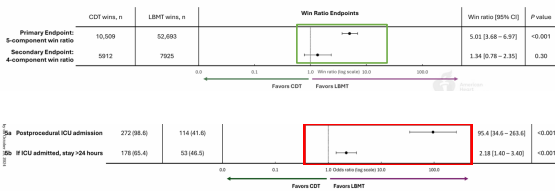
#### mPAP drops appropriately

	LBMT N=274	CDT N=276
Reduction in mPAP, mmHg	5.9 ± 6.3	1.3 ± 7.2

#### Can minimize or obviate ICU time



### Peerless: ICU stay a major driver

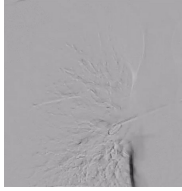


### Reimbursement Strategy

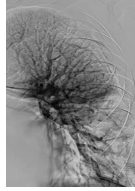
Procedure Category	Mech Thrombectomy		EKOS		CDT		EKOS vs CDT Reimbursement
	MS-DRG	IPPS Payment	MS-DRG	IPPS Payment	MS-DRG	IPPS Payment	
DRG 183		\$32,802			DRG 175	\$9,853	219%
DRG 364		\$17,912	DRG 173	\$21,530	DRG 176	\$5,711	377%
DRG 955		\$ 13,265					



### Pulmonary angiography



Right PA angio  
30ml, 25ml/sec, (70 dye/30 saline)



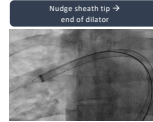
Left PA angio  
30ml, 25ml/sec, (70 dye/30 saline)



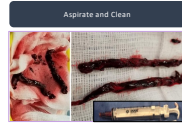
### Mechanical thrombectomy of right PA



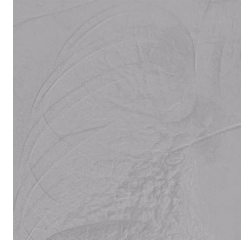
Long super stiff, amplatz, 1cm tip



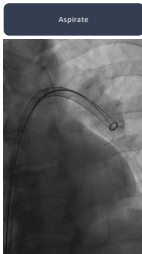
Nudge sheath tip -> end of dilator



Aspirate and Clean



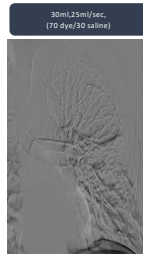
### Mechanical thrombectomy of left PA



Aspirate



**Case Results**  
PA Pressures: 30/15 (20) -> 18/11 (14)  
HR: 124 -> 105 bpm  
SBP: 105 -> 115 mmHg  
O2: 94% -> 99% on 3L  
Procedure time: 75 minutes  
Device time: 55 minutes  
EBL: 125 CCs  
 5 total aspirations  
 No IPA administered



30ml(25ml)/sec,  
(70 dye/30 saline)



### PE & FlowTriever Many questions, many unknowns

Advantage FlowTriever	Disadvantage FlowTriever
<ul style="list-style-type: none"> <li>No lytic requirement</li> <li>Capable of extracting large thrombus</li> <li>Well iterated</li> <li>Modest ICU needs</li> <li>Rapid clinical improvement</li> <li>Visually and clinically satisfying</li> <li>Heme loss declining</li> <li>Financially tolerable (likely more so soon)</li> </ul>	<ul style="list-style-type: none"> <li>No clear outcome benefit</li> <li>Minimal guideline support</li> <li>ICH and Major Bleeding are still seen</li> <li>Does not address small vessel thrombus</li> <li>The competition is knocking at the door</li> <li>Still expensive</li> </ul>



Thank You

