

# Comparative In-Hospital Outcomes of Catheter-Directed Thrombolysis and Systemic Thrombolysis Versus Mechanical Thrombectomy in High-Risk Pulmonary Embolism

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## Purpose

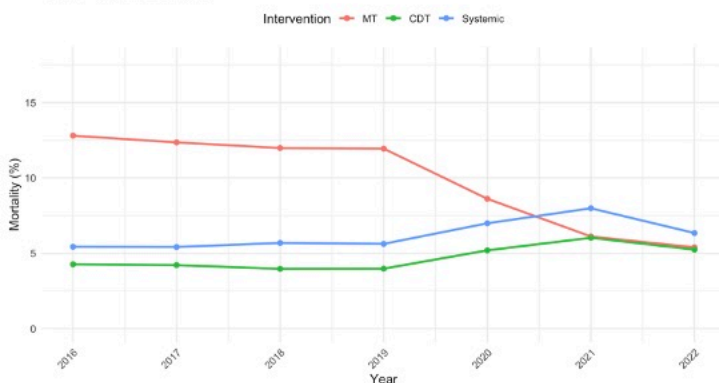
To compare in-hospital outcomes—mortality, major adverse events, and organ-specific complications—in high-risk pulmonary embolism (PE) patients treated with mechanical thrombectomy (MT), catheter-directed thrombolysis (CDT), or systemic thrombolysis.

## Methods

We conducted a survey-weighted, inverse-probability-of-treatment-weighted (IPTW) analysis of 72,362 weighted adult high-risk PE hospitalizations (National Inpatient Sample, 2016–2022) managed with MT (26.1%), CDT (24.0%), or systemic thrombolysis (50.0%). A multinomial logistic model generated IPTW weights, adjusted for age, sex, comorbidities, and hospital characteristics, which were then multiplied by the NIS discharge weights. Survey-weighted logistic regression, using MT as reference, estimated adjusted odds ratios (aORs) and 95% confidence intervals (CIs).

### Trend in In-Hospital Mortality by Intervention (2016–2022)

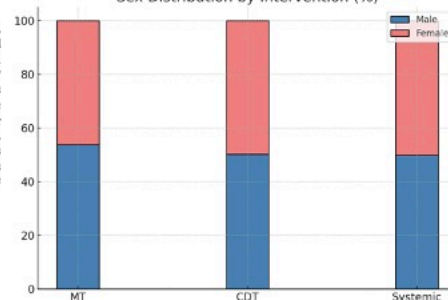
MT = Mechanical Thrombectomy, CDT = Catheter-Directed Thrombectomy, Systemic = Systemic Thrombolysis



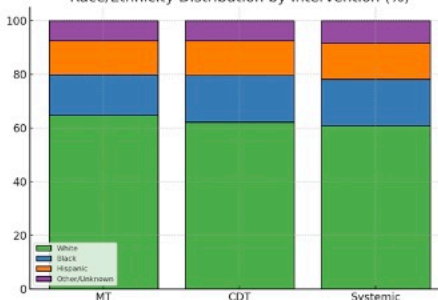
### Figure 1 Summary:

Among 72,362 weighted admissions for high-risk PE, systemic thrombolysis was the most frequently used strategy (50%), followed by MT (26%) and CDT (24%). Patients receiving systemic thrombolysis were slightly older and more often female. Racial distribution was comparable across groups, though Black and Hispanic patients were more frequently treated with CDT or systemic therapy than MT. Comorbidity burden (CHF, arrhythmias, COPD, diabetes, hypertension) was consistently higher in CDT and systemic groups compared with MT, reflecting a sicker baseline population.

### Sex Distribution by Intervention (%)



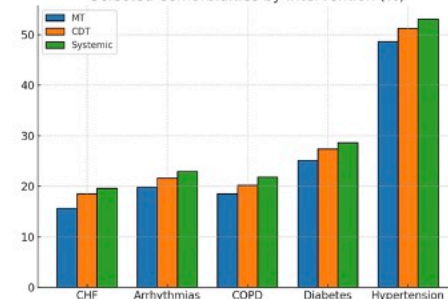
### Race/Ethnicity Distribution by Intervention (%)



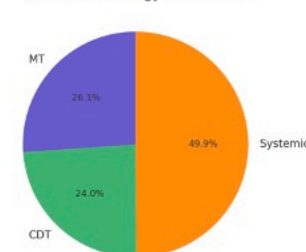
### Figure 2 Summary:

From 2016 to 2022, in-hospital mortality declined across all interventions for high-risk PE. MT initially had the highest mortality (~12–13%) but demonstrated the most pronounced decline after 2019, falling below both CDT and systemic thrombolysis by 2021–2022. CDT maintained consistently low mortality (4–6%) throughout, with only a slight increase in later years. Systemic thrombolysis showed relatively stable mortality (5–8%), with a modest rise peaking in 2021 before trending down in 2022. These patterns suggest improvements in MT outcomes over time, while CDT remained stable and systemic thrombolysis continued to carry higher risk.

### Selected Comorbidities by Intervention (%)



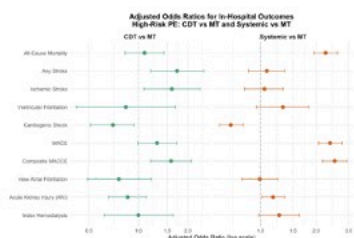
### Treatment Strategy Distribution



## Conclusion

In this nationally representative cohort, MT and CDT yielded similar charges; ST was associated with substantially lower charges. CDT was linked to a modestly longer LOS than MT, and ST did not prolong hospitalization relative to MT. These findings suggest ST achieves cost savings without extending LOS; prospective cost-effectiveness analyses are warranted.

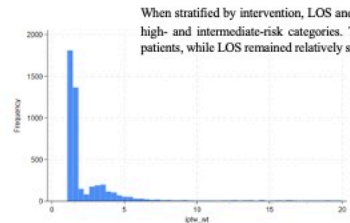
In high-risk PE, MT was linked to lower mortality, cardiogenic shock, and acute kidney injury vs. systemic thrombolysis. CDT had higher stroke risk but less cardiogenic shock than MT. Systemic thrombolysis showed the highest mortality, MACE, MACCE, and AKI. MT may offer survival and organ-protective benefits; prospective trials are needed.



### Figure

The left panel shows adjusted odds ratios (aORs) with 95% CIs for in-hospital outcomes comparing CDT and systemic thrombolysis versus MT in high-risk PE. CDT demonstrated comparable mortality but higher risk of stroke and ischemic stroke, while systemic thrombolysis was associated with significantly higher odds of mortality, MACE, MACCE, and acute kidney injury. Both CDT and systemic thrombolysis reduced odds of cardiogenic shock compared with MT.

The right panel displays the distribution of inverse-probability-of-treatment weights (IPTW), confirming stabilization of the weighting model. Most weights clustered near 1, with a long right tail, indicating appropriate balance achieved across treatment groups.



### Figure

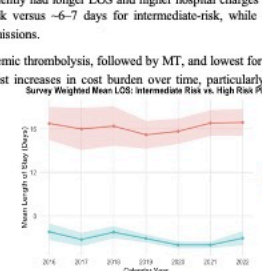
Survey-weighted analyses showed that high-risk PE admissions consistently had longer LOS and higher hospital charges than intermediate-risk cases from 2016–2022. LOS averaged ~11–13 days for high-risk versus ~6–7 days for intermediate-risk, while charges exceeded \$300,000 in high-risk compared with ~\$120,000 in intermediate-risk admissions.

When stratified by intervention, LOS and charges were highest for systemic thrombolysis, followed by MT, and lowest for CDT, across both high- and intermediate-risk categories. Temporal trends showed modest increases in cost burden over time, particularly among high-risk patients, while LOS remained relatively stable after 2019.

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### Summary:

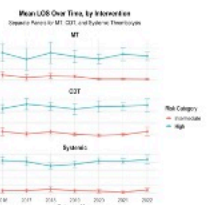
#### Survey-Weighted Mean LOS: Intermediate Risk vs. High Risk PE



#### Survey-Weighted Mean Total Charges: Intermediate Risk vs. High Risk PE



#### Mean LOS Over Time, by Intervention



#### Mean Total Charges Over Time, by Intervention

