Concentration of Hemorrhagic Burden and Interhospital Transfer Vulnerability in Acute Promyelocytic Leukemia: A Nationwide Analysis, 2016–2022

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Why it matters

APL is highly curable—if patients survive the first hours and days.
Rapid coagulopathy can cause catastrophic hemorrhage before definitive therapy begins.
Immediate empiric ATRA
Aggressive platelet and fibrinogen support

Question

Where does early vulnerability concentrate?
Final hospital teaching status?
Interhospital transfer pathway?
We separated severe hemorrhagic burden from death after that phenotype using a descriptive failure-to-rescue framework.

Study design

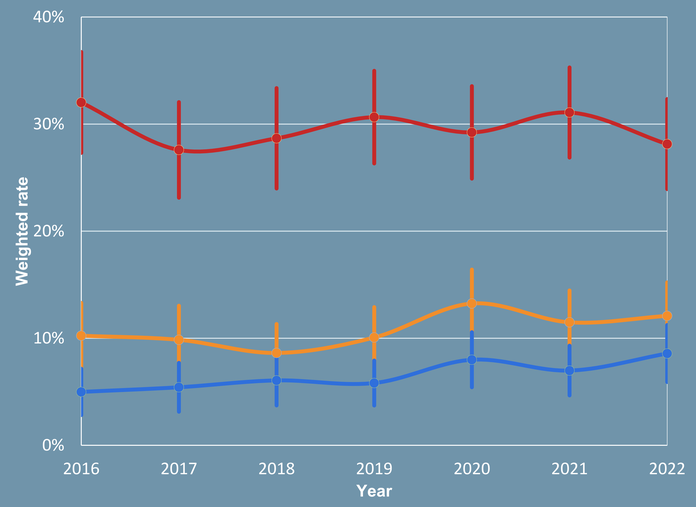
National, weighted retrospective cohort
NIS 2016–2022: 3,000 nonelective adult hospitalizations with active APL (C92.40)
NRD 2016–2022: within-year episode validation
Outcomes: severe hemorrhagic phenotype; in-hospital death; very early death (LOS ≤7 d); conditional death
Survey-adjusted models included demographics, payer, admission and hospital characteristics; NRD estimates were pooled by random effects.

Take-home

TRANSFER PATHWAY—NOT FINAL HOSPITAL LABEL—WAS THE DOMINANT SIGNAL.
Teaching hospitals absorbed greater hemorrhagic burden without higher adjusted overall mortality.
Clinical target: immediate ATRA and uninterrupted hemostatic stabilization from first suspicion through transfer.

Results | Transfer was the dominant signal

Annual national burden remained substantial



RED = severe phenotype **ORANGE** = in-hospital death
BLUE = very early death (LOS ≤7 d)
2016–2022 ranges: 27.6–32.0% severe phenotype; 8.6–13.2% death; 5.0–8.6% very early death.
Points are survey-weighted annual estimates; vertical bars are 95% CIs.

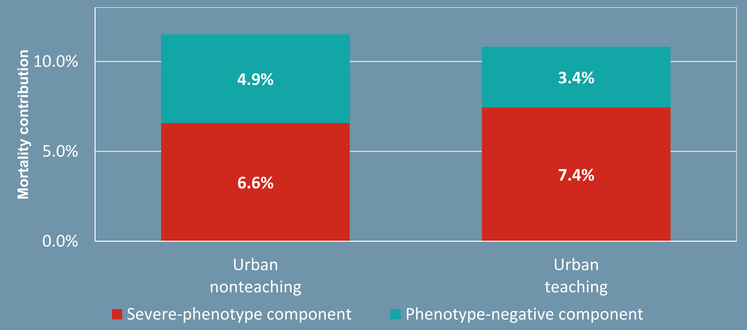
KEY ADJUSTED ASSOCIATIONS

Exposure	Outcome	NIS adjusted OR (95% CI)	NRD pooled OR (95% CI)	Interpretation
Teaching hospital	Severe hemorrhagic phenotype	1.17 (0.87–1.59)	1.40 (1.14–1.73)	Greater burden
Teaching hospital	In-hospital death	0.97 (0.63–1.48)	0.91 (0.66–1.25)	Similar mortality
Transfer pathway	Severe hemorrhagic phenotype	2.47 (1.99–3.06)	2.19 (1.88–2.55)	Concordant ↑
Transfer pathway	In-hospital death	2.52 (1.86–3.39)	1.62 (1.21–2.16)	Concordant ↑
Transfer pathway	Very early death (LOS ≤7 d)	3.17 (2.26–4.46)	—	Largest signal
Transfer pathway	Death after severe phenotype	1.93 (1.16–3.20)	0.82 (0.54–1.24)	NRD survivor selection
Transfer + APR-DRG risk	In-hospital death	1.50 (1.0016–2.25)	—	P=.049; E-value 4.47

NIS = receiving-hospital transfer-in; NRD = linked within-year transfer episode. Conditional estimates are descriptive.

Mortality decomposition

Similar total mortality, different components



What it means

Reconstructed mortality was 11.5% at urban nonteaching hospitals and 10.8% at urban teaching hospitals.
Teaching centers had a larger severe-phenotype component (7.4 vs 6.6 percentage points) but a smaller phenotype-negative component (3.4 vs 4.9 points).

Limitations / data

Administrative coding; no presenting blood counts, ATRA/transfusion timestamps, or reliable present-on-admission hemorrhage timing. Residual transfer confounding and NRD survivor selection remain possible.
Data: HCUP NIS/NRD under applicable data-use agreements.