

Management algorithm for vasoplegic shock after cardiac surgery

Developed by multidisciplinary expert panel of 12 clinicians comprising cardiac surgeons, anesthesiologists, intensivists, and pharmacists from 6 institutions¹

Chatterjee et al provide an expert-derived treatment algorithm to support clinical decisions and institutional protocols for vasoplegic shock with consensus recommendations, including:

- Start norepinephrine as first-line therapy
- Escalate early to vasopressin at NEE 0.10–0.15 mcg/kg/min and angiotensin II at NEE 0.15–0.20 mcg/kg/min before shock becomes refractory

Limitations

- The treatment algorithm reflects a consensus-driven approach informed by frontline clinicians routinely managing vasoplegic shock; however, society-level endorsement was not pursued
- The treatment algorithm is intended to support, not replace, clinical judgment and institutional protocols
- The literature search was iterative and pragmatic, not a formal systematic review

Disclosures

Innoviva Specialty Therapeutics, Inc., in partnership with La Jolla Pharmaceutical Company, markets GIAPREZA® (angiotensin II), and both companies have a financial interest in the product.

NEE=norepinephrine-equivalent.



**Access the
full Chatterjee
publication for free**

Management algorithm for vasoplegic shock after cardiac surgery: an interdisciplinary collaboration. *The Annals of Thoracic Surgery*. 2026. Available at <https://www.sciencedirect.com/science/article/pii/S0003497526005771>

SELECTED IMPORTANT SAFETY INFORMATION

Indication

GIAPREZA® (angiotensin II) increases blood pressure in adults with septic or other distributive shock.

Contraindications

None.

Warnings and Precautions

The safety of GIAPREZA was evaluated in 321 adults with septic or other distributive shock in a randomized, double-blind, placebo-controlled study, ATHOS-3. There was a higher incidence of arterial and venous thrombotic and thromboembolic events in patients who received GIAPREZA compared to placebo-treated patients in the ATHOS-3 study (13% vs. 5%). The major imbalance was in deep venous thromboses. Use concurrent venous thromboembolism (VTE) prophylaxis.

Please see additional Important Safety Information throughout. Before administering, please see [Full Prescribing Information](#) for GIAPREZA.

Recognize the risk factors and clinical indicators for vasoplegic shock

Be prepared to initiate vasopressor therapy promptly in cardiac surgery patients at high risk of vasoplegic shock

Checklist of patient risk factors¹

- ☐ Older age
- ☐ Use of renin-angiotensin system modulators
- ☐ Use of mechanical circulatory support
- ☐ Chronic corticosteroid exposure
- ☐ Reduced ejection fraction heart failure
- ☐ Chronic kidney disease/use of dialysis

Checklist of surgical risk factors¹

- ☐ LVAD implantation
- ☐ Heart transplant with past LVAD support
- ☐ Surgery for infective endocarditis
- ☐ Combined operations
- ☐ Redo cardiac surgery
- ☐ Longer cardiopulmonary bypass times
- ☐ Longer aortic cross-clamp times
- ☐ Hemorrhage and transfusion
- ☐ Deep hypothermic circulatory arrest

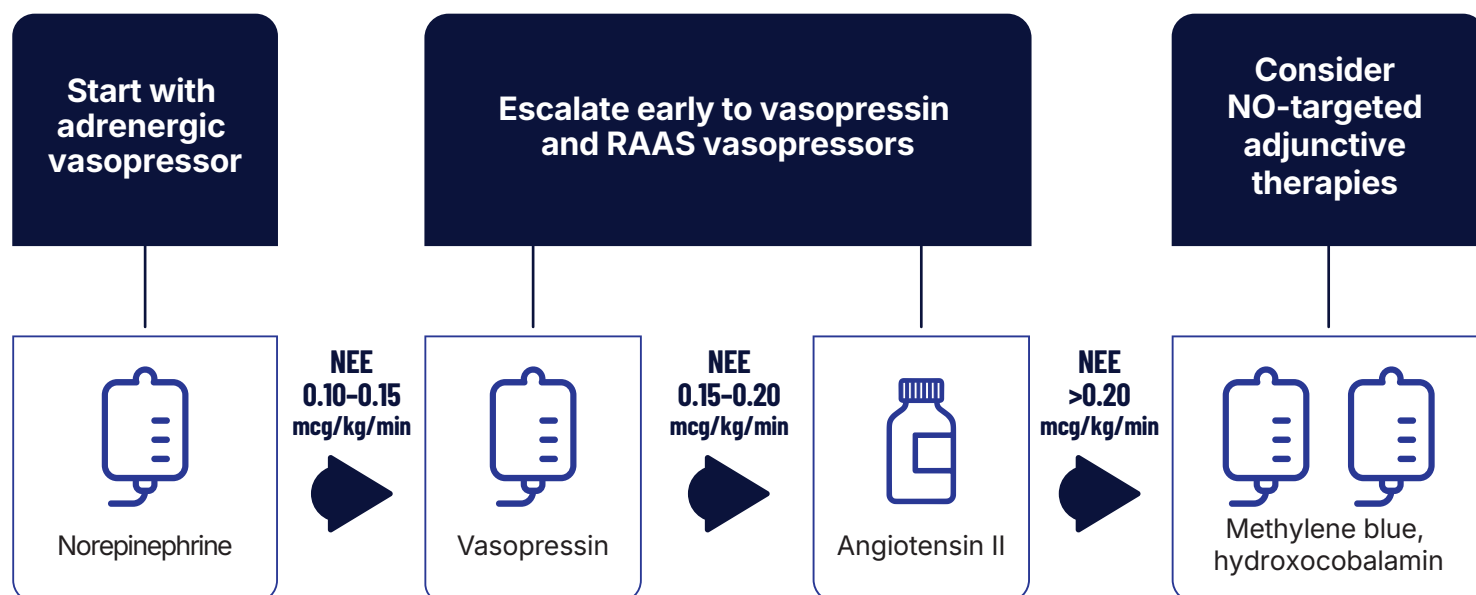


Confirm vasoplegic shock by assessing cardiac surgery patients for clinical indicators^{1,2}

- MAP <65 mmHg
- Normal to elevated cardiac output
- Hypovolemia excluded (fluid and transfusion needs addressed)
- Cardiogenic shock (including RV failure) excluded
- Tamponade excluded
- Mechanical causes excluded

LVAD=left ventricular assist device; MAP=mean arterial pressure; RV=right ventricular.

Follow a structured treatment algorithm until patient MAP is stabilized¹



MAP is the primary therapeutic target in vasoplegic shock as it reflects organ perfusion

	Angiotensin II	Methylene blue	Hydroxocobalamin
Mechanistically complementary but not interchangeable	• Direct vasoconstrictor • Works via the RAAS pathway, supporting MAP even when catecholamine resistance is evident	• NO synthase inhibitor • Soluble guanylate cyclase inhibitor	• NO scavenger • NO synthase inhibitor • H₂S scavenger

H₂S=hydrogen sulfide; MAP=mean arterial pressure; NEE=norepinephrine-equivalent; NO=nitric oxide; RAAS=renin-angiotensin-aldosterone system.

SELECTED IMPORTANT SAFETY INFORMATION

Adverse Reactions

The most common adverse reactions reported in greater than 10% of GIAPREZA® (angiotensin II)-treated patients were thromboembolic events. Adverse reactions occurring in ≥4% of patients treated with GIAPREZA and ≥1.5% more often than placebo-treated patients in the ATHOS-3 study were thromboembolic events (including deep vein thrombosis), thrombocytopenia, tachycardia, fungal infection, delirium, acidosis, hyperglycemia, and peripheral ischemia.

Please see additional Important Safety Information throughout. Before administering, please see [Full Prescribing Information](#) for GIAPREZA.

Use standardized NEE dosing to guide treatment escalation decisions¹

Convert different vasopressor doses to the standardized NEE dose to track patient's vasopressor load¹⁻⁴

Vasopressor	Typical dose	NEE conversion factor	NEE dose
Norepinephrine	0.05 mcg/kg/min	Reference agent	0.05 mcg/kg/min
Vasopressin	0.04 unit/min	Multiply by 2.5	0.10 mcg/kg/min
Angiotensin II	10 ng/kg/min	Multiply by 0.0025	0.02 mcg/kg/min

NEE is a measure of total vasopressor exposure that converts each vasopressor dose into an equivalent norepinephrine dose based on its relative potency.

"NEE provides a unified framework to quantify shock severity, compare vasoactive burden across agents, and define thresholds for [vasopressor] therapy."

— Chatterjee et al 2026



**DISCUSS WITH
YOUR PEERS**

How does your team currently define when to escalate beyond norepinephrine and vasopressin in vasoplegic shock?

NEE=norepinephrine-equivalent.

SELECTED IMPORTANT SAFETY INFORMATION

Drug Interactions

Angiotensin converting enzyme (ACE) inhibitors may increase response to GIAPREZA® (angiotensin II). Angiotensin II receptor blockers (ARBs) may reduce response to GIAPREZA.

You are encouraged to report negative side effects of prescription drugs to the FDA.

To report SUSPECTED ADVERSE REACTIONS, please contact:

La Jolla Pharmaceutical Company 1-800-651-3861 | medicalinformation@ljpc.com.

U.S. Food and Drug Administration 1-800-FDA-1088 | www.fda.gov/medwatch

Please see additional Important Safety Information throughout. Before administering, please see Full Prescribing Information for GIAPREZA.

References: 1. Chatterjee S, Ortoleva J, Arora RC, et al. Management algorithm for vasoplegic shock after cardiac surgery: an interdisciplinary collaboration. *Ann Thorac Surg.* 2026;S0003-4975(26)00577-1. doi:10.1016/j.athoracsur.2026.06.013 2. Mistry RN, Winearls JE. Management of vasoplegic shock. *BJA Educ.* 2025;25(2):65-73. doi:10.1016/j.bjae.2024.10.004 3. GIAPREZA. Prescribing information. La Jolla Pharmaceutical Company; 2021. 4. Kotani Y, Di Gioia A, Landoni G, et al. An updated "norepinephrine equivalent" score in intensive care as a marker of shock severity. *Crit Care.* 2023;27(1):29. doi:10.1186/s13054-023-04322-y



INNOVIVA Specialty
Therapeutics

GIAPREZA® is marketed by Innoviva Specialty Therapeutics, Inc. in partnership with La Jolla Pharmaceutical Company. ©2026 Innoviva Specialty Therapeutics™. All rights reserved.
PR-GIA-US-0153 09/26

GIAPREZA.com