

Standard Operating Procedure

Frusemide stress in Acute Kidney Injury(AKI)

Special region (1)

Union of Myanmar

Version 1.0

Effective date:24th May 2026

Review date: 24th May 2026

Approved by: Internal Medicine

1. Introduction

Furosemide stress test (FST) to assess the risk of progression to Stage 3 AKI, including RRT in adults with Stage 1 or 2 AKI who are euvolemic or hypervolemic. The test should be performed using standardized dosing and urine output thresholds and interpreted in the context of overall clinical assessment.

1. Acute Kidney Injury

1.1. Definition of AKI

Acute kidney injury (AKI) is defined by the presence of one or more abnormalities of kidney function or structure known or presumed to have occurred within 7 days.

Functional criteria	Structural Criteria
Increase in serum creatinine (SCr) by ≥0.3 mg/dL (≥26.5 μmol/L) within 48 hours	Elevation of a validated and regulatory-qualified biomarker of kidney damage known or presumed within prior 7 days
Increase in SCr by ≥1.5 times baseline known or presumed within prior 7 days	
Increase in serum cystatin C by ≥1.5 times baseline known or presumed within prior 7 days	
Mean urine output <<0.5 mL/kg/h (ideal body weight) for ≥6 hours	

Note

- Cystatin C is now recommended as alternative functional criterion when creatinine is unavailable e.g. muscle wasting , liver diseases).
- *Cystatin C is early and sensitive functional biomarker in sudden drop Glomerular Filtration Rate (GFR) (Creatinine - blind zone).*
- Unlike creatinine (primarily serum), cystatin C can be measured in both serum and urine, offering dual diagnostic utility.

2.2. Severity of AKI

The severity of AKI is staged according to individual components or combinations of serum creatinine (C), urine output (U), and structural damage

biomarkers (B). Relevant components can be employed based on measurements available.

Stage	Serum Creatinine (C) Criteria	Urine Output (U) Criteria	Biomarker (B) Criteria
C0 / U0	No change	No oliguria	B1 = Positive B0 = Negative
C1 / U1	≥0.3 mg/dL (≥26.5 μmol/L) increase, OR 1.5–1.9 × baseline	<0.5 mL/kg/h for 6–12 hours	B1 = Positive B0 = Negative
C2 / U2	2.0–2.9 × baseline	<0.5 mL/kg/h for >12 hours	B1 = Positive B0 = Negative
C3 / U3	≥3.0 × baseline, OR SCr ≥4.0 mg/dL (≥353.6 μmol/L), OR Initiation of RRT	<0.3 mL/kg/h for >24 hours , OR Anuria for >12 hours	B1 = Positive B0 = Negative

Notes

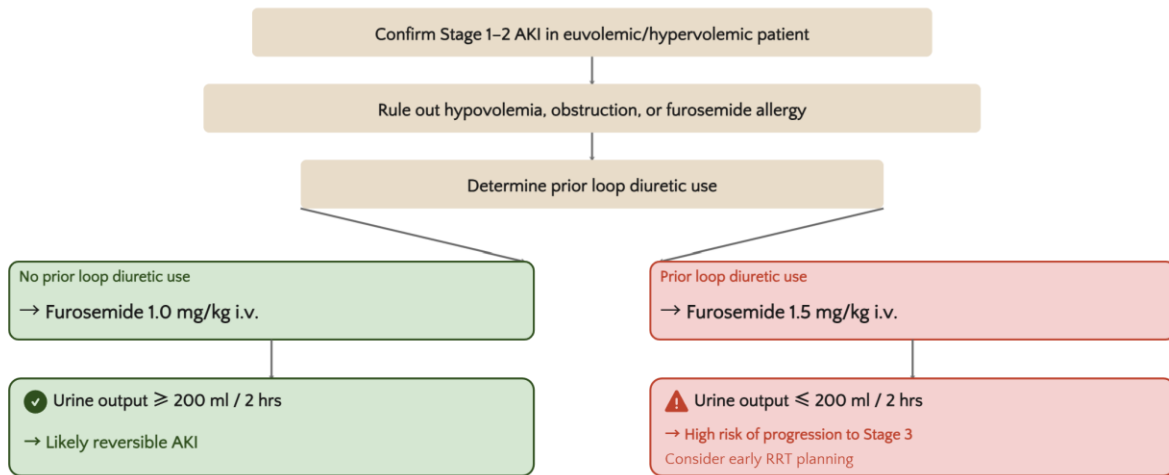
- C1–C3 = creatinine stage; U1–U3 = urine output stage; B0/B1 = biomarker negative/positive. The highest stage reached by any criterion defines overall severity
- Structural biomarkers: Validated damage biomarkers (e.g., TIMP-2·IGFBP7, NGAL) can now diagnose AKI without functional decline.

2. Purpose of Frusemide stress test in AKI

- Dynamic assessment of tubular function
- Benefit from kidney protective strategies
- Help identify people who are at higher risk of progression to stage-3 AKI, including the need for RRT.

4. Protocol of furosemide stress test

Furosemide Stress Test – Clinical Protocol



Source: KDIGO 2026 Clinical Practice Guideline for Acute Kidney Injury (AKI) and Acute Kidney Disease (AKD) – Recommendation 2.3.1
Grade 2C (adults) / 2B (children) | Applies to euvolemic or hypovolemic patients with Stage 1 or 2 AKI

Condition	2-hr urine output	Risk of RRT	Risk of AKI progression
Responders	≥200 ml	~ 13.6 %	Low
Non-responders	<200 ml	75.98.3	High

5. References

1. KDIGO 2026 AKI/AKD Guideline Public Review Draft (March 2026)
2. KDIGO 2012 Clinical Practice Guideline for Acute Kidney Injury
3. Chawla LS, Davison DL, Brasha-Mitchell E, et al. Development and standardization of a furosemide stress test to predict the severity of acute kidney injury. *J Am Soc Nephrol.* 2013;24(5):807-815. doi:10.1681/ASN.2012070644
4. Lumlertgul N, Peerapornratana S, Trakarnvanich T, et al. Early versus standard initiation of renal replacement therapy in furosemide stress test non-responsive acute kidney injury (EARLYRRT). *Lancet.* 2020;396(10250):252-260. doi:10.1016/S0140-6736(20)30598-6
5. Chen Y, Yang S, Li H, et al. The diagnostic and prognostic value of furosemide stress test in acute kidney injury: A systematic review and meta-analysis. *J Crit Care.* 2020;57:268-275. doi:10.1016/j.jcrc.2020.03.014