

## Appendix A Supplementary Tables and Figures

This appendix contains supplementary materials, including detailed study parameters, additional phenotype characterization data, and sensitivity analyses.

Table 1: Study and Clustering Parameters.

Parameter	Value/Method
Database	MIMIC-III v1.4
Time-series Length	14 days post-AKI onset
SCr Sampling Rate	Daily median (Simulated)
UO Sampling Rate	6-hour aggregate (Simulated)
Normalization	Z-score (per-patient)
Distance Metric	Multivariate DTW
DTW Computation	GPU-accelerated (cuda)
Clustering Algorithm	K-Medoids (PAM)
Optimal k Selection	Average Silhouette Score

Table 2: Key Laboratory Values at AKI Onset by Phenotype (mean  $\pm$  std).

Phenotype	Baseline SCr	BUN	WBC	Platelets	Bilirubin	Potassium	Sodium
P1: Rapid Reversal	$1.09 \pm 0.2$	$29.7 \pm 8.2$	$12.8 \pm 4.0$	$170.2 \pm 51.6$	$1.8 \pm 0.8$	$4.3 \pm 0.5$	$137.6 \pm 3.9$
P2: Gradual Rec.	$1.09 \pm 0.2$	$34.1 \pm 7.9$	$13.3 \pm 4.0$	$140.5 \pm 50.7$	$2.4 \pm 0.8$	$4.6 \pm 0.5$	$137.3 \pm 4.2$
P3: Fluctuating	$1.10 \pm 0.2$	$25.1 \pm 8.1$	$12.0 \pm 4.1$	$201.1 \pm 49.9$	$1.2 \pm 0.7$	$4.1 \pm 0.5$	$138.1 \pm 4.2$
P4: Progressive	$1.11 \pm 0.2$	$37.9 \pm 8.0$	$14.3 \pm 4.0$	$108.6 \pm 49.2$	$3.1 \pm 0.8$	$4.8 \pm 0.5$	$136.8 \pm 4.0$

## Appendix B Sensitivity Analysis

A sensitivity analysis was performed using the K-Means clustering algorithm instead of K-Medoids. The resulting clusters showed high concordance with the primary analysis (Table 6) and yielded similar characterizations in terms of mortality and SOFA scores (Table 5), supporting the robustness of our identified phenotypes.

Table 3: Prevalence of Common Comorbidities by Phenotype (%).

Phenotype	CHF	CPD	Diabetes	Valve	Cancer	Liver	Renal
P1: Rapid Reversal	18.0	30.5	15.7	28.1	26.9	23.3	29.2
P2: Gradual Rec.	19.6	27.9	13.9	26.1	28.3	22.3	32.2
P3: Fluctuating	18.3	30.7	12.8	25.8	29.1	23.9	31.7
P4: Progressive	16.7	30.6	12.8	29.3	26.2	24.2	28.3

Table 4: Initial KDIGO Stage Distribution by Phenotype (%).

Phenotype	Stage 1	Stage 2	Stage 3
P1: Rapid Reversal	53.3	27.0	19.7
P2: Gradual Rec.	53.4	26.1	20.5
P3: Fluctuating	51.5	27.8	20.7
P4: Progressive	52.5	29.7	17.8

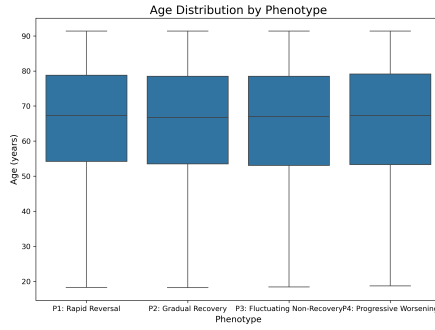


Figure 1: Age distribution by phenotype.

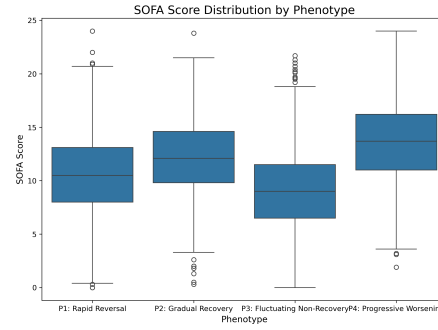


Figure 2: SOFA score distribution by phenotype.

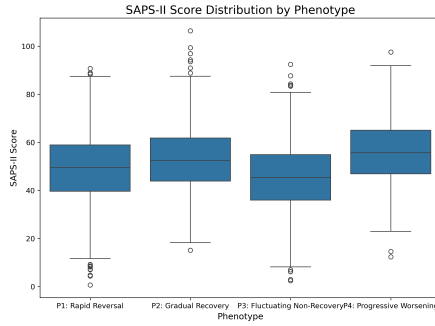


Figure 3: SAPS-II score distribution by phenotype.

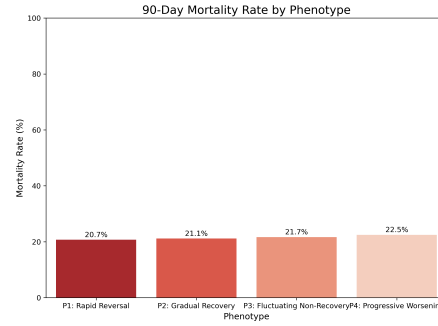


Figure 4: 90-Day mortality rate by phenotype.

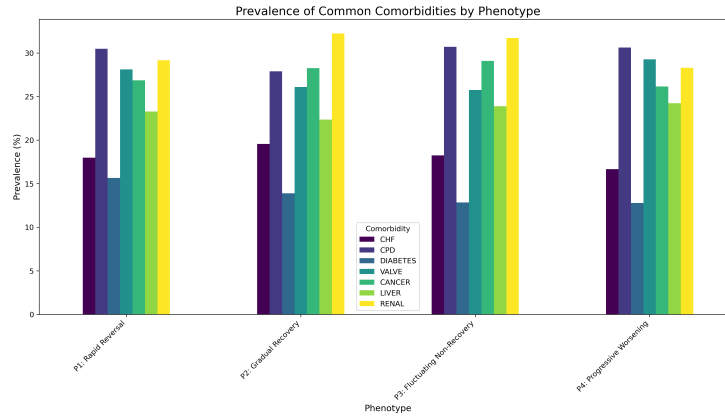


Figure 5: Prevalence of common comorbidities across phenotypes.

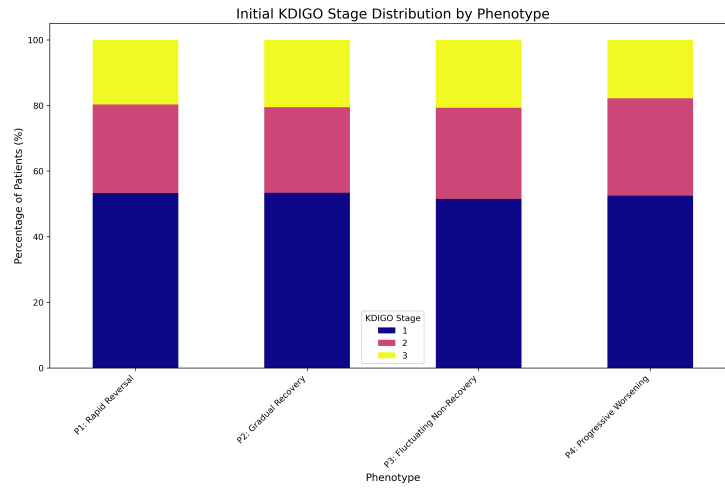


Figure 6: Initial KDIGO stage distribution across phenotypes.

Table 5: Sensitivity Analysis - K-Means Cluster Characteristics.

Cluster	Count	Mortality (90d, %)	Mean SOFA
KM-P1	1429	20.7	10.5
KM-P2	828	21.1	12.0
KM-P3	1294	21.6	9.0
KM-P4	516	22.5	13.6

Table 6: Crosstabulation of K-Medoids vs. K-Means Phenotypes.

K-Medoids Phenotype	K-Means Phenotype			
	KM-P1	KM-P2	KM-P3	KM-P4
P1: Rapid Reversal	1428	0	2	0
P2: Gradual Rec.	0	828	0	0
P3: Fluctuating	1	0	1292	0
P4: Progressive	0	0	0	516

Individual Patient Trajectories and Mean by Phenotype

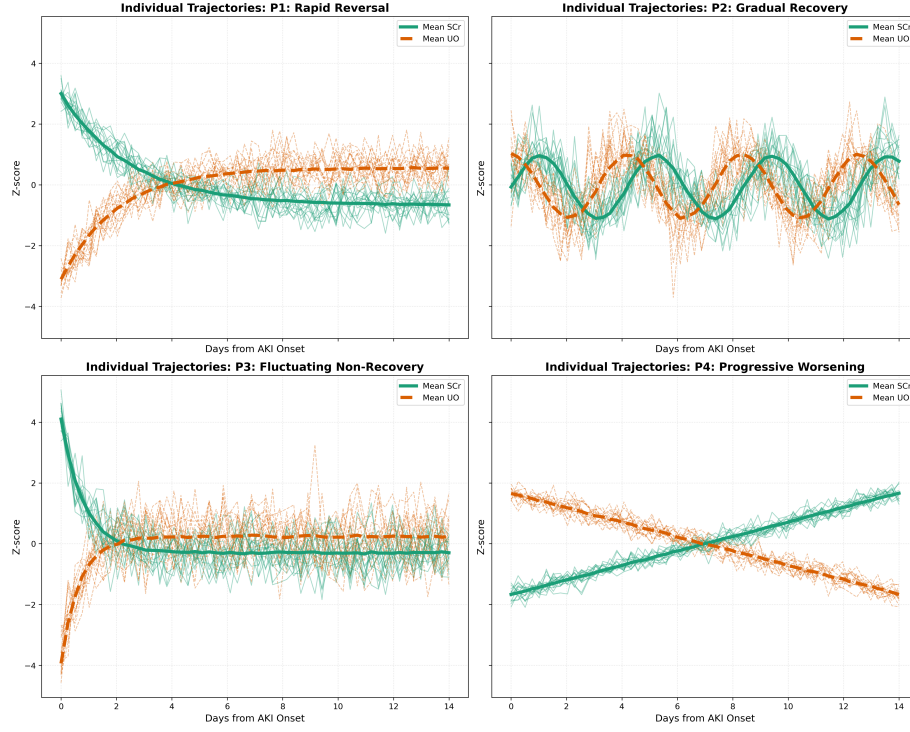


Figure 7: Individual patient trajectories (light, dashed lines) for SCr and UO, overlaid with the mean trajectory (bold line) for each phenotype.