Interobserver Reliability of Acute Kidney Injury Network (AKIN) criteria
A single center cohort study

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Background

Acute kidney injury (AKI) is a common complication in the intensive care units, affecting more than 35% of critically ill patients. This syndrome is associated with markedly increased mortality and morbidity in hospitalized patients.

Until the beginning of this millennium there were more than 30 different definitions of AKI.

In 2006 Acute Kidney Injury Network (AKIN) defined AKI and subsequently it was endorsed by Kidney Disease: Improving Global Outcomes (KDIGO) (Figure 1).

The interobserver reliability of the AKIN criteria has not been studied.

Our goal was to have two observer review a cohort of patients independently to evaluate their agreement.

Objectives

To evaluate the inter-observer reliability of Acute Kidney Injury Network (AKIN) criteria by two independent mutually masked observers.

This study was done to validate the AKIN/KDIGO criteria.

Methods

The study was approved by local IRB and due to retrospective nature of the study informed consent was waived.

We screened 761 consecutive admissions in Mayo Clinic adult (> 18 years old) ICU between January 12, 2010 to March 23, 2010. Twenty two patients did not have signed research authorization and they were excluded.

Out of the remaining 739 admissions 100 were readmission to ICU. The second admission to ICU was excluded. 639 patients reviewed to enroll 479 patients in the final analysis after removing patients with exclusion criteria (Figure 2).

The exclusion criteria were having diagnosis of AKI prior to ICU admission (n=71), history of end stage kidney disease on renal replacement therapy or after transplant (n=44), and patients who did not have any serum creatinine measured while they were admitted in the ICU, during the index admission. Baseline characteristics of enrolled patients can be found in table 1.
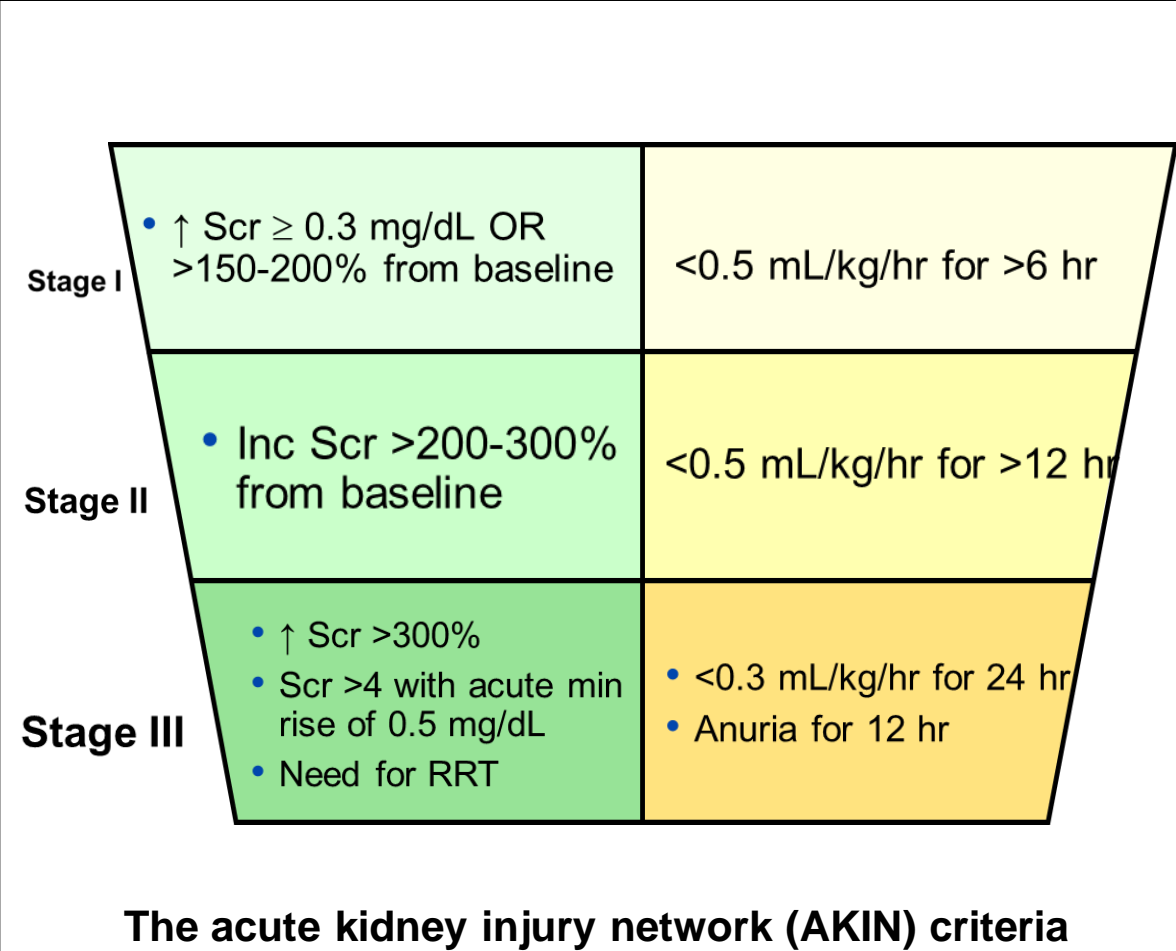
Two independent mutually masked physician investigators retrospectively reviewed electronic medical records, including clinical notes, intake/output charts, and laboratory data in all of the 479 enrolled patients to define AKI based on AKIN criteria (figure 1).

The baseline serum creatinine was defined as median of all serum creatinines measured within the 6 months prior to the index admission. For those patients who did not have baseline serum creatinine measured, we used MDRD formula for eGFR of 60 ml/min. Interobserver agreement between the two reviewers for the maximum AKIN stage was calculated using Cohen's weighted kappa (κ) (figure 2).

Table 1

Baseline characteristics	
Gender, Female	212 (43.8%)
Race, White	413 (89%)
Age, year, median	66 (IQR 49, 75)
APACHE III, median	61 (IQR 49, 78)
SOFA, median	2 (IQR 4,6)
BScr, mg/dL, median	0.8 (IQR 0.6-1.1)
BMI, kg/m^2, median	27.8 (IQR 24-33)
Unit type (%)	
MICU	43
SICU	34
Mixed	23

Figure 1

Stage I	• ↑ Scr ≥ 0.3 mg/dL OR >150-200% from baseline	<0.5 mL/kg/hr for >6 hr
Stage II	• Inc Scr >200-300% from baseline	<0.5 mL/kg/hr for >12 hr
Stage III	• ↑ Scr >300% • Scr >4 with acute min rise of 0.5 mg/dL • Need for RRT	• <0.3 mL/kg/hr for 24 hr • Anuria for 12 hr

The acute kidney injury network (AKIN) criteria

Results

639 adult patients were reviewed for our inclusion criteria. 479 patients entered the final analysis (figure 2). Of 479 adult patients who met our inclusion criteria, 212 (43.8%) were females with a , median age of 66 years (IQR 49-75); and 413 (89%) were Caucasians.

The median APACHE III score and SOFA scores were as 61 (IQR 49-78) and 2 (IQR 4-6), respectively. Baseline serum creatinine for enrolled patients based on the median of the serum creatinine measured within the 6 months prior to admission was 0.8 (IQR 0.6-1.1).
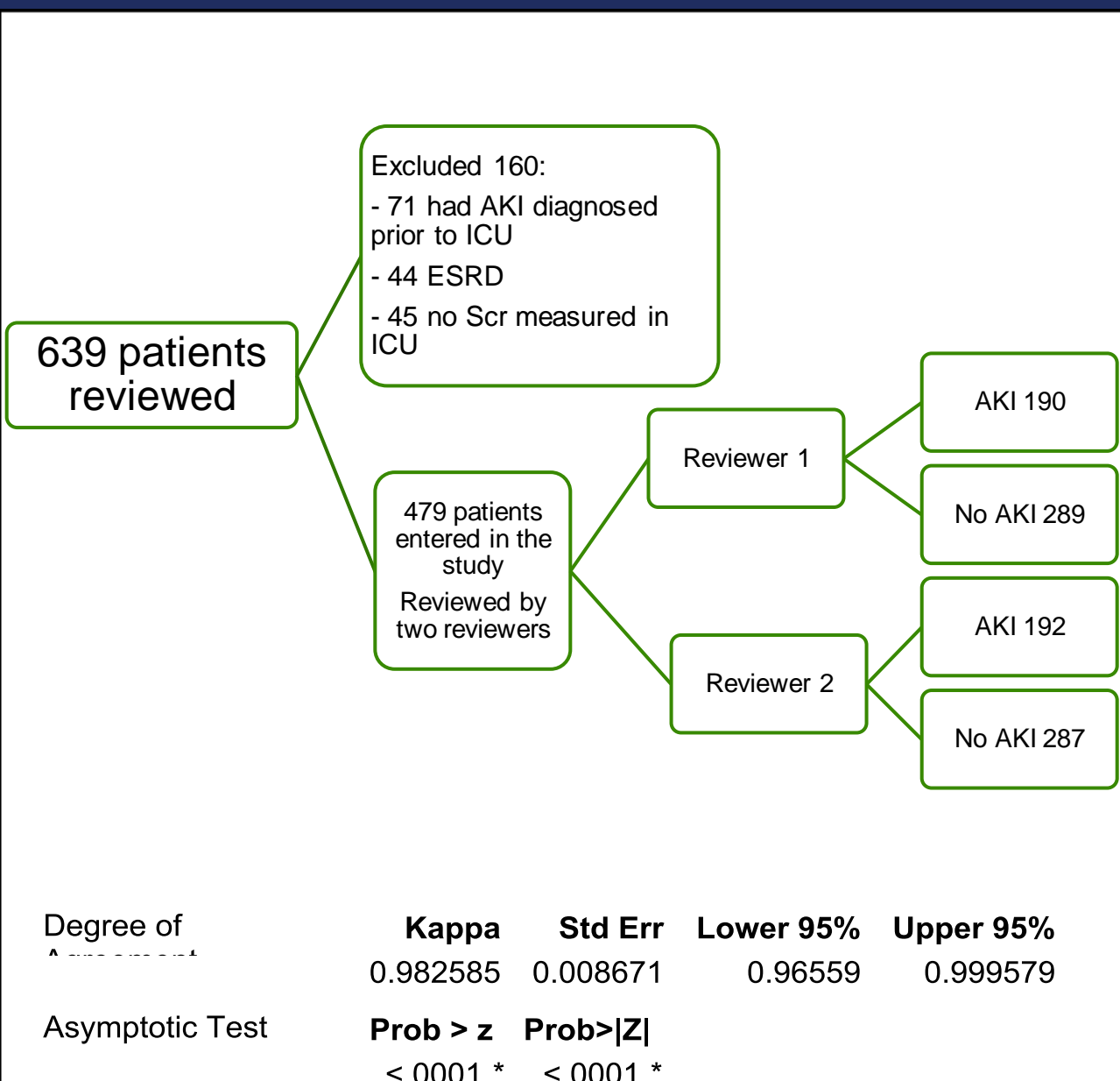
The interobserver agreement between the two independent reviewers were excellent (k= 0.983; 95% confidence interval [CI] = 0.97 - 0.99).

In a sensitivity analysis after inclusion of 45 patients who were originally excluded due to lack of serum creatinine measurement during their ICU LOS, the Interobserver agreement between the two reviewers remained excellent (k= 0.965; 95% confidence interval [CI] = 0.94 - 0.99).

Conclusions

• We conclude that the interobserver agreement to retrospectively assess AKI by the AKIN criteria is excellent.

• This study demonstrates that AKI detection by manual chart review is reproducible and suitable for clinical studies.

Figure 2

Degree of Agreement	Kappa	Std Err	Lower 95%	Upper 95%
	0.982585	0.008671	0.96559	0.999579
Asymptotic Test	Prob > z	Prob>|Z|		
	<.0001 *	<.0001 *		

References

1. Mehta RL, Kellum JA, Shah SV et al. Acute kidney injury network: report of an initiative to improve outcomes in acute kidney injury. Crit Care 2007; 11: R31

2. Waikar SS, Liu KD, Chertow GM: The incidence and prognostic significance of acute kidney injury. Current opinion in nephrology and hypertension 2007;16:227-236.

3. Waikar SS, Liu KD, Chertow GM: Diagnosis, epidemiology and outcomes of acute kidney injury. Clinical journal of the American Society of Nephrology : CJASN 2008;3:844-861.