

Frequency of Creatinine Testing and Acute Kidney Injury Identification and Staging

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Background

Criteria to identify and stage acute kidney injury (AKI) establish time intervals when the serum creatinine (SCr) should increase to be considered AKI. These intervals range from 48 hours to 7 days (depending on AKIN or KDIGO criteria). Subsequently, timely SCr test should be performed to inpatients, preferentially no longer than 48h.

Purpose of Study

To evaluate the impact of real-world SCr testing hospital practice for the identification and staging of AKI.

Study Design and Methods

A historical cohort study with data from medical records of patients admitted to hospital between 1 Jun 2018 and 31-Dec 2020, was conducted. AKI stage was calculated using two criteria: AKIN and KDIGO. Identification and staging were first done considering the time intervals when the SCr increase should be identified as described in the two criteria. Then, a second staging process was conducted ignoring the time intervals and considering all the hospitalization time. Length of stay (LoS) was calculated by adding 1 day to the difference between discharge and admission dates. Creatinine clearance (eGFR) was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) creatinine-based equation. Additionally, KeGFR was determined using the Chen equation. For KeGFR, CKD-EPI served as the eGFR, and SCr at admission was considered the steady-state creatinine. The lowest value between these two metrics was identified for each hospitalization. A list of drugs that require dose adjustment when CrCl achieves 50 mL/min was obtained from The Renal Drug Handbook 3rd edition.

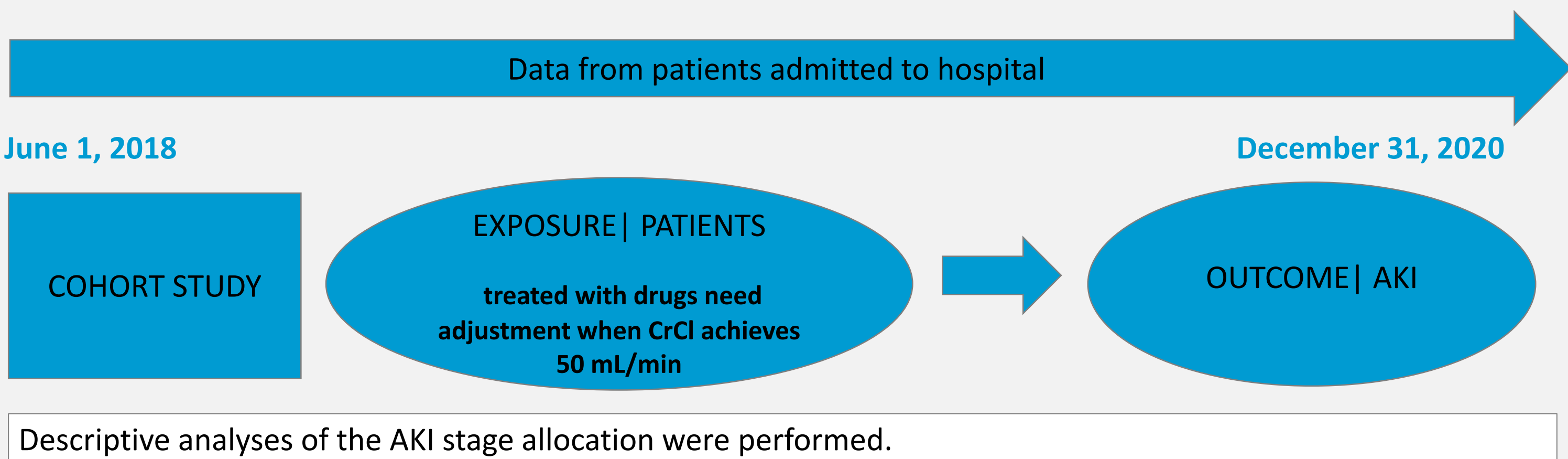


Table 1. Criteria used to identify and stage acute kidney injury.

Criteria	Time interval		
	AKIN	KDIGO	
Stage 1	Increase in serum creatinine $\geq 1.5x$ above baseline	48 hours	7 days
	Absolute increase in serum creatinine ≥ 0.3 mg/dL	48 hours	48 hours
Stage 2	Increase serum creatinine $\geq 2x$ above baseline	48 hours	7 days
Stage 3	Absolute increase in serum creatinine ≥ 4 mg/dL	48 hours	7 days
	Increase serum creatinine $\geq 3x$ above baseline	48 hours	7 days

AKIN: Acute Kidney Injury Network; KDIGO: Kidney Disease Improving Global Outcomes

Results

During the study period, 17,269 hospitalizations and 62,255 SCr tests were recorded. Among the 17,032 hospitalizations with LoS>48h, 46.8% presented periods >48h with no SCr tests performed. In 3.5% of hospitalizations, patient's weight was not registered. Any stage of AKI was identified in 7.0% and in 9.1% of patients using AKI and KDIGO criteria, respectively. When ignoring time limits in both criteria, potential AKI could have occurred in 1,942 patients (11.2%). A total of 76 different drugs requiring dose adjustment in patients with eGFR \leq 50 ml/min were prescribed in 78.5% admissions, and 30.3% of all admissions included patients prescribed with these drugs that reached eGFR<50 ml/min.

Figure 1. Kinetic estimated glomerular filtration rate (KeGFR) of admissions not identified as with acute kidney injury with AKIN (A) and KDIGO (B) criteria, but with creatinine elevations over the criteria limits.

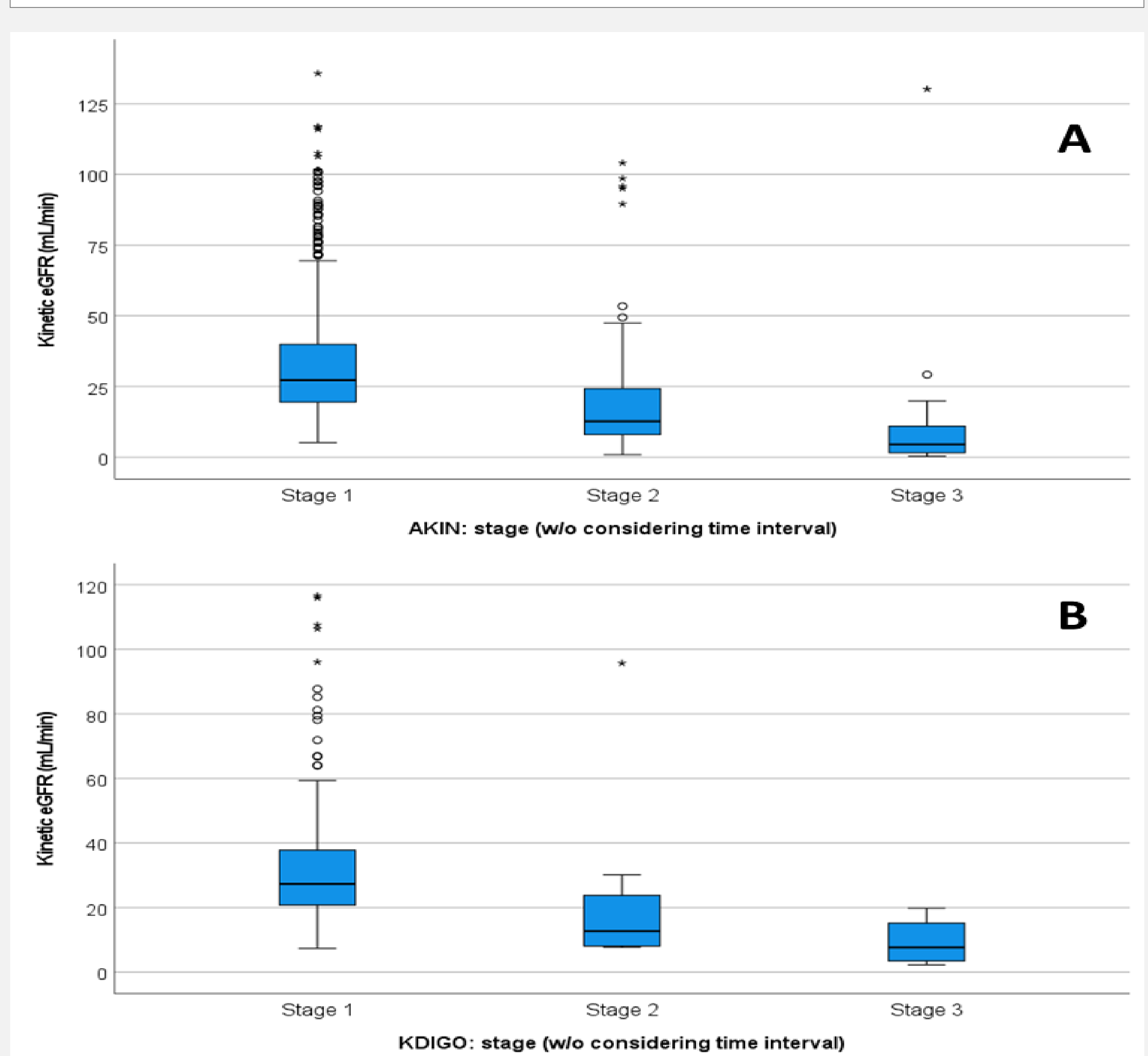


Table 2. Inpatients achieving acute kidney injury when considering or ignoring the time intervals of creatinine elevations.

N= 17,269 hospitalizations	Ignoring time for SCr changes	AKIN time intervals	KDIGO time intervals
No AKI	15,327 (88.6%)	16,055 (93.0%)	15,697 (90.9%)
Stage 1	1,608 (9.3%)	1,042 (6.0%)	1,260 (7.3%)
Stage 2	257 (1.5%)	140 (0.8%)	241 (1.4%)
Stage 3	77 (0.4%)	32 (0.2%)	71 (0.4%)

AKI: Acute Kidney Injury; AKIN: Acute Kidney Injury Network; KDIGO: Kidney Disease Improving Global Outcomes; SCr: Serum creatinine

Conclusion

Our study suggests that real-world SCr testing hospital practice for the identification and staging of acute kidney injury may not be sufficient to identify all the AKI occurrences. Organizational or legal changes are necessary to contribute to timely use of analytic values to optimize therapy and thus increase patient safety.

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