

# Practices Among Healthcare Providers Taking Care of Critically Ill Patients with Acute Kidney Injury: A Survey

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## Introduction

Acute kidney injury (AKI) is seen in over fifty percent of critically ill patients and is associated with high mortality. The general approach to managing AKI include early detection or risk prediction, identifying etiology, avoiding nephrotoxins, carefully monitoring kidney function, and optimizing hemodynamics and volume status<sup>1</sup>.

Over the last several years, several tools have become available for diagnosing and managing AKI. These include novel biomarkers, prediction models, clinical decision support systems, point-of-care ultrasound (POCUS), and best practice Kidney Disease: Improving Global Outcomes (KDIGO) AKI guidelines<sup>2</sup>. Although they have been shown to improve AKI patient outcomes, their utilization is reported as limited<sup>3</sup>. We designed this study to determine the utilization of different tools used for the diagnosis and management of AKI among multidisciplinary healthcare professionals caring for critically ill patients.

## Methods and Materials

We designed an anonymous web-based survey to identify practice patterns for diagnosing and managing AKI among multidisciplinary healthcare professionals caring for critically ill patients. The survey was built using RedCap and disseminated to members of the Society of Critical Care Medicine (SCCM) through the organization's Research Surveys Services. The survey included sixteen questions, with the first six focused on the demographics of responders and the remainder dedicated to the diagnosis and management of AKI.

This was a descriptive study with categorical variables presented as counts and percentages. The Chi-squared test or Fisher's exact test was utilized for comparing categorical variables and alpha was set at 0.05. We performed pre-planned analysis to identify differences in responses based the roles, practice-type, experience and number of AKI patients seen in last six months of the responders.

## References

1. Himmelfarb J, Joannidis M, Molitoris B, et al. *Clin J Am Soc Nephrol*. Jul 2008
2. KDIGO clinical practice guideline for acute kidney injury. *Kidney Int Suppl*. 2012
3. Kolhe NV, Staples D, Reilly T, et al. *PLoS One*. 2015

## Results

There were 365 responders to our survey with the majority attending intensivists (63 %). Sixty one percent of responders practiced in academic centers. Responders practice in a variety of ICU settings and about half report caring for at least 50 patients with AKI in the last six months (table 1).

The most common reason for nephrology consultation was for renal replacement therapy. Non-attending responders were more likely to consult nephrology for persistent AKI. One quarter of responders reported using POCUS at least 75% of the time in volume assessment (table 2).

Only 15% of responders reported using novel biomarkers and only 6% of responders reported using prediction models to identify patients at risk of AKI (table 3).

Role	Value
Attending Intensivist	230 (63%)
Nurse practitioner	46 (12.6%)
Pharmacist	33 (9%)
Fellow	26 (7%)
Other	30 (8.2%)
Work setting	
Academic center	224 (61.3%)
Community Hospital	120 (33%)
Academic and community hospital	21 (5.8%)
Responders' academic rank	
Professor	59 (16%)
Associate Professor	59 (16%)
Assistant Professor	86 (24%)
Instructor/Lecturer	27 (7.5%)
Lecturer	10 (2.7%)
Type of ICU*	
Medical	117 (32%)
Surgical	148 (41%)
Cardiovascular/thoracic	83 (23%)
Neurological	62 (17%)
Pediatric	60 (16%)
Mixed/Other	117 (32%)
Experience in critical care	
<5 years	80 (21.9%)
5-10 years	97 (26.6%)
10-20 years	83 (22.7%)
>20 years	105 (28.7%)
Estimated number of patients with AKI under the care of responders in the past six months	
< 25 patients	57 (15%)
25-50 patients	131 (36%)
50-75 patients	70 (19%)
75-100 patients	46 (13%)
>100 patients	61 (17%)

Table 1. Demographics

Consulting Nephrology*	Value
Any AKI	11 (3%)
AKI persists for more than 48 hours	68 (19%)
AKI KDIGO stage 2 or 3	152 (42%)
For renal replacement therapy (dialysis)	207 (57%)
When a primary kidney disorder is suspected (e.g., glomerulonephritis)	112 (31%)
Other	12 (3.3%)
Use of Urine microscopy	
Never/Unavailable	60 (16.4%)
Less than 25% of the time	66 (18%)
25-75% of the time	69 (19%)
More than 75% of the time	54 (15%)
Always	71 (20%)
Performed by nephrology	45 (12%)
Use of a formal ultrasound	
Never	21 (6%)
<25% of the time	127 (35%)
25-75% of the time	122 (33%)
>75% of the time	66 (18%)
Always	29 (8%)
Use of bedside POCUS of the kidneys	
Never	205 (56.2%)
<25% of the time	107 (29%)
25-75% of the time	30 (8%)
>75% of the time	15 (4%)
Always	8 (2%)
Use of bedside POCUS for volume assessment	
Never	87 (23.8%)
<25% of the time	86 (24%)
25-75% of the time	106 (29%)
>75% of the time	61 (17%)
Always	25 (7%)

Table 2. Practices and Management

Use of biomarkers to diagnose AKI	Value
Yes	55 (15%)
No	310 (85%)
Use of specific biomarkers in practice (N=55)	
Cystatin C	40 (73%)
Nephrocheck (TIMP-2 and IGFBP-7)	10 (18%)
NGAL	18 (33%)
Others	2 (4%)
Use of novel biomarkers in practice (N=55)	
<25% of the time	20 (36%)
25-75% of the time	17 (31%)
>75% of the time	14 (25%)
Always	4 (7%)
Use of prediction models to identify patients at high risk of developing AKI	
No	340 (93%)
Not answered	5 (1%)
Type of prediction model used (N=20)	
Static	8 (40%)
Dynamic	12 (60%)
Frequency of use of the prediction models (N=20)	
<25% of the time	3 (15%)
25-75% of the time	7 (35%)
>75% of the time	2 (10%)
Always	7 (35%)
Not answered	1 (5%)
Usefulness of prediction models (N=20)	
Not at all useful	2 (10%)
Somewhat useful	17 (85%)
Very useful	1 (5%)
Use of clinical support system	
Yes	25 (6.8%)
No	338 (92.6%)

Table 3. Use of biomarkers, prediction models, and decision support systems

## Discussion

The survey showed that there is wide variation in the use of tools for diagnosing and managing AKI with less than half of those caring for patients with AKI in the ICU routinely using POCUS, biomarkers, prediction models, or a clinical decision support system in their practice. Most responders report consulting nephrology in the minority cases of AKI. Intensivists working in medical ICU and academic centers requested nephrology consultation for AKI more often than others.

## Conclusions

- There is significant variation in the diagnosis and management of AKI in the ICU
- There is underutilization of biomarkers, POCUs, predictive models, and clinical decision support systems, and possibly, nephrology consultation in the diagnosis and management of AKI in the ICU
- This study supports continued efforts to promote education on the diagnosis and management of AKI in critically ill patients