

# Renal Replacement Therapy in Adult Intensive Care Unit: An ISCCM Expert Panel Practice Recommendation

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## ABSTRACT

Acute kidney injury (AKI) contributes significantly to morbidity and mortality in ICU patients. The cause of AKI may be multifactorial and the management strategies focus primarily on the prevention of AKI along with optimization of hemodynamics. However, those who do not respond to medical management may require renal replacement therapy (RRT). The various options include intermittent and continuous therapies. Continuous therapy is preferred in hemodynamically unstable patients requiring moderate to high dose vasoactive drugs. A multidisciplinary approach is advocated in the management of critically ill patients with multi-organ dysfunction in ICU. However, an intensivist is a primary physician involved in life-saving interventions and key decisions. This RRT practice recommendation has been made after appropriate discussion with intensivists and nephrologists representing diversified critical care practices in Indian ICUs. The basic aim of this document is to optimize renal replacement practices (initiation and management) with the help of trained intensivists in the management of AKI patients effectively and promptly. The recommendations represent opinions and practice patterns and are not based solely on evidence or a systematic literature review. However, various existing guidelines and literature have been reviewed to support the recommendations. A trained intensivist must be involved in the management of AKI patients in ICU at all levels of care, including identifying a patient requiring RRT, writing a prescription and its modification as per the patient's metabolic need, and discontinuation of therapy on renal recovery. Nevertheless, the involvement of the nephrology team in AKI management is paramount. Appropriate documentation is strongly recommended not only to ensure quality assurance but also to help future research as well.

**Keywords:** Acute kidney injury, Continuous renal replacement therapy, Intensivist, Multidisciplinary team.

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## HIGHLIGHT

Critically ill patients with severe AKI in ICU may require RRT. An intensivist with adequate training and experience in RRT can initiate, monitor, and supervise RRT in ICU. However, a patient-centric holistic approach is recommended with multidisciplinary team involvement as and when required.

## BACKGROUND

The current need of the healthcare system is to improve the quality of care and ensure continuous access to financially sustainable care. Over the last decade, AKI has come to prominence as a major contributor influencing outcomes in critically ill patients. The incidence of AKI is now believed to be significantly higher than previously thought, with over 50% of patients<sup>1</sup> in the ICU developing stage 1 AKI at some point during the course of their illness. However, stages 2 and 3 AKI are considerably less. Overall, the requirement of RRT is approximately 10%.<sup>2</sup> Renal replacement therapy is a modality used in the management of AKI. Management strategies continue to reflect supportive measures focusing on optimization of hemodynamics, fluid delivery, diuretics, avoidance of nephrotoxic agents, and RRT for the most severe cases. The dynamic nature of AKI requires a new approach using newer advanced technology. Clinicians can provide therapies tailored to time constraints (intermittent, continuous, or extended intermittent), hemodynamic, and metabolic requirements and aimed at molecules of variable

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molecular weight. Although multiple system organ failure (MSOF) and other comorbidities contribute to a high mortality rate, AKI independently increases morbidity and mortality. Acute kidney injury is an independent risk factor for hospital mortality and is common in ICU. Efforts to improve outcomes in AKI are likely to have a beneficial impact on patients.

## AIM AND OBJECTIVE

To frame recommendations as to how the Intensivists can contribute to the conductance and management of RRT in ICU for critically ill patients in the most effective manner under the specific challenges prevalent in Indian circumstances.

## METHOD

A committee of experts from the field of Critical Care and Nephrology was constituted.

### Members

The selection of Committee members was done in such a manner to represent the diverse critical care practice patterns across the country. There were 16 members in the panel with a mixture of intensivists and nephrologists from various parts of India and the globe, each with at least 15 years of clinical experience. It included 14 senior Intensivists and two senior Nephrologists from public teaching hospitals and private corporate hospitals involved in the management of multi-specialty ICUs from bigger cities and smaller towns of India who are actively involved in continuous renal replacement therapy (CRRT) management in critically ill patients. All participants Committee members shared their views and experiences concerning the management of patients with AKI, the need and management of dialysis in ICUs in India, and the challenges involved.

### Search Strategy

The literature search was conducted on this aspect. Various medical databases (Pubmed, MEDLINE, Cochrane library, Google Scholar) were searched with the specific keyword "Intensivist", "training in CRRT", and "AKI" with the intent to review the training process and practice of CRRT in the management of AKI.

### Data Review and Consensus

The views expressed were derived from analysis of literature, personal communications regarding practices prevalent in a few countries like the USA, UK, and Australia, and expert opinions. The written views and suggestions of the committee members were collated, and recommendations were to be made after consensus was achieved.

All the available data were reviewed to understand the current trend of training intensivists for the use of CRRT in critically ill patients and usage of CRRT in ICUs in the management of critically ill patients. Several rounds of online meetings were organized, and a discussion was initiated on individual aspects to reach a consensus. The basis of consensus was primarily based on the experience of practice as well as training requirements of other critical care procedures due to the paucity of data related to CRRT training. Thus, recommendations were finally scripted after consensus among all committee members.

The recommendations made here are not graded as they represent opinions and practice patterns and are not based on

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evidence or a systematic literature review. They are meant to optimize appropriate patient care and represent practice patterns rather than trials.

This is not intended to replace the role of a Nephrologist in the ICU. This paper strongly recommends a multidisciplinary integrated team approach in caring for critically ill patients.

This document describes the need for coordinated patient-centric care of critically ill patients with multiorgan involvement, requiring RRT, and intending to improve the quality of care. Timely and individualized patient-centric interventions can be done promptly following this approach. Individual units with established protocols may continue to follow the conventional pathways.

### Review of Literature

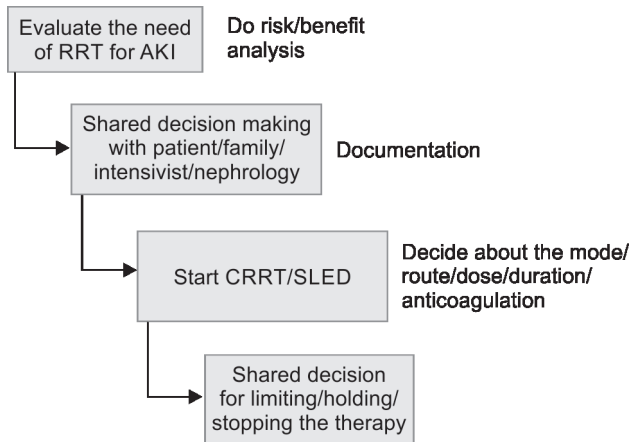
Acute kidney injury is a clinical syndrome with organ cross-talk with dynamic variables. It needs close and continuous monitoring and timely appropriate round-the-clock interventions.

Critically ill patients may require CRRT while on vasopressor infusions and supported with extracorporeal membrane oxygenation and intra-aortic balloon counter pulsation after major surgery. Critically ill patients require a particular kind of expertise that is now within the purview of the intensivist.<sup>3</sup> Renal Replacement Therapy is one such modality used for AKI in critical care patients to ameliorate several organ dysfunctions.

As per the ISCCM recommendation on the definition and role of Intensivist,<sup>3</sup> it is the responsibility of the critical care specialist to perform and supervise major life-saving interventions like mechanical ventilation, RRT, etc. Intensivists<sup>3</sup> should be able to recognize the need for RRT and should be able to start this therapy at the appropriate time without causing harm.<sup>4,5</sup>

Though the recent literature has shown an inclination toward ICU team-led CRRT management and focuses on ICU nurses' training, however, there are no specific recommendations regarding training or minimum knowledge/training for intensivists to practice CRRT.<sup>5</sup>

The acute dialysis quality initiative (ADQI) consensus<sup>6</sup> for developing countries noted that the availability of appropriate technology and expertise, including that for the pediatric population, should be available at the optimum time, despite local regulations and resources. The onus of providing this care rests on trained and experienced staff and expert support. Many times the use of these modalities is required during emergency hours. There should be a collaborative approach between the Intensive care and Nephrology teams.

**Flowchart 1:** Flow diagram for emergency RRT

Acute dialysis quality initiative 18 recommends that all dialytic equipment and trained personnel should be available on 24 hour basis. However, due to the dearth of nephrologists, the critical care physician may have to take independent decisions along with nurses and technicians regarding the effective use of RRT in intensive care. Intensivists in developing countries may face problems of limited resources, reduced availability of trained personnel, equipment, and administrative barriers. These factors may affect the patient selection, choice of RRT modality, and delay in initiation of RRT.

Within this model, it is logical that the intensivists take initiative in the medical management of AKI, while critical care nurses or technicians perform CRRT, troubleshooting on a minute-to-minute basis within the ICU.

Renal replacement therapies, especially CRRT, for AKI patients in ICU are considered part of core Intensive Care training.

### Providing Renal Replacement Therapy

While assessing a patient for RRT, we must weigh the initiation risks, complications, overall prognosis, potential for recovery, and patient preferences (Flowchart 1). The timing of initiation of RRT may be debatable but the recent KDIGO Controversies Conference proposed that decision-making on starting RRT should be a shared process with patients and families.<sup>7</sup> Selection of modality, the dose of therapy, access, anticoagulation, and duration of therapy should be considered in the context of available resources and expertise of personnel.

The selection of the RRT modality depends on the capability/availability of the technology, its inherent risks, and the current needs of the patient.<sup>8</sup>

In a resource-limited setting, all modalities may not be available and different patients may require different modalities of RRT at the same time, or the same patient may require different modalities during the course of his illness. Sustained low-efficiency dialysis (SLED) may be used by Intensivists either independently in emergencies or in collaboration with Nephrologists and dialysis unit staff as an alternative to CRRT for logistical reasons.

Sustained low-efficiency dialysis, however, was used in 25% of centers in developing countries as compared to 20% in developed countries. A survey from India showed that 57% of Intensivists preferred SLED for hemodynamically unstable patients compared to 38% who preferred CRRT.<sup>9</sup>

The setup for SLED should conform to the ISN minimum standards for dialysis.<sup>10</sup>

A technician with adequate training in machine maintenance should be available on a 24-hour basis as stipulated in the ADQI 18 consensus statement.

Marshall et al.<sup>11</sup> have published a study on the use of SLEDD-f in an intensive care unit run by dedicated ICU nurses with acceptable results in critically ill patients.

### Quality Measures in RRT

Continuous renal replacement therapy is generally a resource-intensive and relatively expensive technology. Major goals of RRT include desired toxic solute clearance, acid-base homeostasis, electrolyte balance, appropriate fluid removal and balance, and temperature control. These goals should be achieved in a timely and effective manner. Though it is a supposedly continuous therapy, there may be interruptions during the therapy. Unplanned pauses during the therapy may decrease its efficacy and safety.<sup>12</sup> The most commonly mentioned quality indicators (QIs) focused on filter lifespan, small solute clearance, bleeding, delivered dose, and treatment interruption.

The transition of modalities should be considered if the demand-capacity imbalance or treatment priorities have changed and can be better met by an alternative technique. KDIGO recommends that CRRT and intermittent hemodialysis should be considered complementary.

So, the committee recommends the following as the role and responsibilities of Intensivists for conducting RRT in ICU as and when required:

- **Identifying/Selecting a patient for RRT:**  
An Intensivist who is adequately trained and experienced in managing critically ill patients should be able to identify/select a patient who can be a candidate for RRT after methodically ruling out the correctable/treatable causes of the development of AKI.
- **Selection of therapy:**  
Intensivists should be trained to perform CRRT and emergent SLED (only in AKI) as dialytic therapy to treat patients with severe AKI. However, they must consult a Nephrologist to perform maintenance dialysis therapy. Intensivists should choose the modalities (CRRT or SLED) depending upon various factors such as availability, logistics, cost, etc. But the primary domain of Intensivist should be CRRT. However, they should be capable of performing emergent SLED therapies in AKI.
- **Writing a prescription for RRT:**  
An Intensivist who has been adequately trained and competent in conducting CRRT can write a prescription advising CRRT independently.
- **Access:**  
An Intensivist who is trained and capable of putting in central venous access can perform cannulation for RRT.
- **Management of RRT:**  
An Intensivist with adequate training and experience should be capable enough to monitor, identify, and treat biochemical change, especially during CRRT. He/She should also be able to identify and manage common complications and the need for a change of prescription.
- **Discontinuation of RRT:**  
The Intensivist independently or in coordination with a nephrologist (preferably) should decide on discontinuation of

RRT in case of renal recovery or switch over to chronic therapy (IHD/SLED).

- *Documentation and record keeping:*

The person performing the RRT must keep appropriate documentation and should maintain the record of therapies to evaluate areas of quality improvement and assessment complications.

- *Transition in the type of RRT inside ICU:*

Transition within the ICU from CRRT to other modalities may be performed jointly by the Intensivist and Nephrologists with a subsequent shift to non-critical areas or upon shifting the patient to non-critical areas under the care of the appropriate specialists.

- *Multi-disciplinary team approach:*

The panel strongly recommends a multidisciplinary integrated team approach in caring for critically ill patients with multiorgan involvement, requiring RRT, and intending to improve the quality of care. Prompt liaison and close coordination with the nephrology team to be done as deemed necessary by the Intensivist at all times.

Individual units with established protocols may continue to follow tried and tested patterns.

## CONCLUSION

Critically ill patients with severe AKI in ICU may require RRT. An Intensivist with adequate training and experience in RRT can initiate, monitor, and supervise RRT in ICU. However, a patient-centric holistic approach is recommended with multidisciplinary team involvement as and when required.

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