

## Acute Dialysis Quality Initiative

### 2<sup>nd</sup> International Consensus Conference

#### REVIEWS

*ADQI workgroup reports were sent to leading experts who served as external reviewers.*

*Reviewers were asked to provide reviews and editorial comment on the workgroup reports.*

#### Workgroup 1: Definition for Acute Renal Failure

##### *Raúl Lombardi*

This report establishes ten recommendations, and concludes by proposing a classification system for ARF on the basis of serum creatinine levels and urinary output. The point of departure is a conceptual definition of ARF: an abrupt and sustained decrease in renal function. The task proposed consists of translating this definition into clinical and biochemical terms.

**Recommendation 1.** Renal function should be assessed using some estimate of glomerular filtration rate (GFR), since it can be evaluated easily and routinely. There is general agreement in this respect. The proposed “RIFLE” definition of ARF includes GFR and urinary output. However, I believe that the urinary output is not a very specific marker of renal function: it may be reduced in the presence of normal renal function (e.g. dehydration) or it may be present and even increased in renal failure (non-oliguric ARF, which in fact represents the most frequent form of ARF) (1). Therefore, I suggest leaving urinary output out of this recommendation, defining ARF as an “abrupt and sustained decrease in GFR”. On the other hand, the urinary output reduction reflects a reduction of the GFR, and the inclusion of this criterion would not only be confusing, but redundant as well.

**Recommendation 2.** That ARF should be defined in terms of a change from baseline, and be abrupt (1-7 days) and sustained (>24 hrs); that it should include “acute-on-chronic” disease and should be based on clinically available data that are consistent across centers; and finally, that it involve a multi-level classification system. This recommendation is appropriate in all its terms, particularly in the inclusion of “acute-on-chronic ARF”, since this is a significant risk group that cannot be excluded from the group of patients with ARF.

**Recommendation 3.** “Serum creatinine and urine output provide the best existing markers of ARF”. This is undoubtedly one of the most difficult issues to define, since there are no reliable markers available, as pointed out by some authors. Having said this, I believe urinary output should be excluded as an ARF marker. In my view, urinary output can not be classified as one of the best ARF markers, at the same level as serum creatinine levels.

**Recommendation 4.** There are no doubts that the classification of ARF must include the presence or absence of oliguria, but the issue is defining oliguria. Traditionally, oliguria has been defined as a daily urinary output under 400-500 ml. Considering that the importance of this classification lies on the fact that it is a marker of severity, both of ATN and evolution (2-3), I believe that the cutoff point should be redefined. There is growing evidence that suggest a revision of the classical cutoff, at least related to mortality (4-5). In an unpublished, series of 148 patients with ARF, I founded similar results.

**Recommendation 5.** “When baseline creatinine is unknown, it should be estimated from the MDRD equation.” This is appropriate, inasmuch as it offers a simple and accessible way of estimating Scr when its baseline level is not known.

**Recommendation 6.** For “acute-on-chronic” disease, an acute rise in  $S_{Cr}$  (of at least 0.5 mg/dL or 44  $\mu$ mol/L) to more than 4 mg/dL (350  $\mu$ mol/L) will serve to identify most patients with ARF when their baseline  $S_{Cr}$  is abnormal. This is one of the most controversial aspects. The authors propose one criterion. My view is that the best criterion to be selected is the most sensitive.

**Recommendation 8.** I would offer the same comments as described above, concerning urinary output. The very frequent (and often unjustified) use of diuretics in patients with ARF makes it difficult “that ARF criteria should assume a clinical state that is as close to natural as possible”.

**Recommendation 9.** “ARF criteria should be applied to all forms of ARF in the critically ill except for primary renal disease such as glomerulonephritis.” Conceptually, the recommendation is controversial, but from a practical point of view, and for the purpose of this initiative, the conclusion is adequate. However, there is an issue that is not discussed in the document: should prerenal ARF be included in the definition of ARF in this document? My bias is that it should not, since on one hand it is not strictly a failure, but a way the kidney responds under maximum stress, with no function loss. On the other hand, certain clinical facts, particularly severity and prognosis of prerenal azotemia are very different from ATN, and hence, the comparison of series that include prerenal ARF may lead to error, resulting from its relative frequency in each series.

Finally, with respect the classification scheme called RIFLE, I think one could argue the use of the term *Risk* to define the first level. Risk refers to the odds for an event to occur. In the definition, the initial stage, –risk- is defined by a >25% reduction of GFR, which indicates there is already renal injury. The difference between level 1 (risk) and level 2 (injury) in this definition is quantitative and not conceptual. I consider that it is very important to define a risk category, since it highlights a situation in which there is a chance to prevent renal damage (ARF), something that leads to a substantial change in prognosis. Risk, in my view, should be defined by the description of potentially harmful situations (low blood pressure, low cardiac output, hypovolemia, use of potentially nephrotoxic, pre-existing renal failure, sepsis, etc).

## References

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*Peter Skippen*

### Workgroup 1: Definition for Acute Renal Failure

I am presenting my comments from the following 3 perspectives: 1. as a critical care specialist; 2. with consideration of the pediatric critical care population; and 3. from the standpoint of practical bedside management.

In general, I like the content of the report on “Definition of Acute renal Failure”, but the same issues arise as in most other publications on this topic – the exclusion of the pediatric patient. Understandably, it might be considered that the pediatric patient is different, and they are. However, many similarities exist, that might allow for their inclusion in a review such as this.

### *Etiology*

The etiology of ARF in the critical care environment is similar to adult ICU’s:

1. sepsis
2. post cardiac surgery – cardiogenic (not necessarily shock but low output syndrome)
3. hypovolemia
4. in the setting of cancer and its treatment

The post common cases of ARF in pediatric patients rarely present to the PICU unless complicated by CNS involvement. Yet ARF in pediatric patients requiring dialytic therapy is uncommon, and few critical care units manage more than 5-10 cases each year. The definition of ARF in pediatric patients is similarly vague. But from my perspective, and as I manage the most common group of children with ARF (the post cardiac surgical patient or septic shock), the diagnosis of ARF is made by the following:

1. oliguria (once again no set definitions, but  $< 0.3\text{mls/kg/hr}$  is a “no-brainer”)
2. clinical setting – clinical low output syndrome

3. an increasing urea and creatinine – once again, there is no set level. The clinical situation is a child on multiple inotropes, receiving large volume resuscitation, becoming severely fluid overloaded and third spacing. Specific levels of increase of BUN and creatinine in this situation are difficult to interpret – my approach is that if it is increasing by ANY amount, with the above associations, this child is likely developing or already in acute renal failure
4. increasing potassium despite no added potassium
5. hyperlactatemia

### *Outcome*

Mortality of pediatric ARF is high, but there are no prospective studies. Data from our unit suggest that most children who receive CRRT die, but most of the patients in this case series were neonates. Most pediatric studies do NOT use CRRT in neonates or infants. Despite this, the more recent but limited publications of CRRT in children with ARF (once again, no definition was given or indications for commencing CRRT - the discretion of the attending nephrologists) have survival of only 42% for these children (1). The suggestion in the adult literature is that patients are sicker before they are initiated on CRRT or self selected as acute HD is felt to be too risky (2). The same can be said for the pediatric population. Imagine initiating acute HD in a child with overwhelming meningococemia, or postcardiac surgical low cardiac output syndrome. The incidence of acute renal failure in children undergoing cardiac surgery is low (less than 10%), and is always associated with the low cardiac output syndrome (LCOS). If the child recovers from the LCOS, the renal failure will resolve within 3-7 days.

### *Clinical Utility*

As a bedside clinician, there are not really any markers currently available that will allow me to make the decision of when to initiate some form of dialytic therapy. In our unit, the ICU attending makes that decision in 90% of the clinical situations). The value does lie however in the clinical trials that the ADQI recommends. There is nowhere more important for this important indication than in pediatric critical care. From my Canadian perspective, we are missing some important pieces before any definition can be utilized for clinical studies:

1. few patients in any one centre. Even within the USA, 21 children in 18 months in a large urban PICU is “about as busy as it gets”!
2. no national database to track the entry of patients
3. no good repository of information from follow up of patients who have developed ARF and recovered.
4. not all PICU’s perform CRRT

Two recent publications discuss the issue of surrogate measures. One of these papers is a review by authors of the ADQI (3). The other is a new publication from a group in Toronto that retrospectively reviewed 2000 post cardiac surgical adult patients (4). These authors wished to identify the best surrogate marker for ASRF and death. They compared largest change in serum creatinine within the first 72 hours post surgery as well as the % change during the same time period. They gave a definition of ARF consistent with what is

in the review, but suggested better predictability by using their own markers – an increase in creatinine > 50 micromoles/L rather than 44 micromoles/L, and a decrease in calculated creatinine clearance of >25% from baseline in patients with normal preoperative renal function (the later being consistent with RIFLE-R). There is no comparative pediatric study using number of this volume.

## References

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