Recent Guidelines for acute kidney injury by KDIGO and ERBP

Belek, Antalya 23.10.2014

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Clinical Practice Guideline for Acute Kidney Injury
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A European Renal Best Practice (ERBP) position statement on the Kidney Disease Improving Global Outcomes (KDIGO) Clinical Practice Guidelines on Acute Kidney Injury:
**KDIGO**

- KDIGO is the global organization developing and implementing evidence-based clinical practice guidelines in kidney disease. It is an independent volunteer-led self-managed charity incorporated in Belgium accountable to the public and the patients it serves.

**MISSION:** To improve the care and outcomes of kidney disease patients worldwide through the development and implementation of global clinical practice guidelines.

**ERBP**

- The ERA-EDTA Council has nominated an advisory board to discuss and define the future of European nephrology recommendations and guidance.

**MISSION:** To improve the outcome of patients with kidney disease [...] through enhancing the availability of the knowledge on the management of these patients in a format that stimulates its use in clinical practice in Europe.
### Nomenclature and Description for Rating Guideline Recommendations

<table>
<thead>
<tr>
<th>Grade*</th>
<th>Patients</th>
<th>Clinicians</th>
<th>Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1</strong> “We recommend”</td>
<td>Most people in your situation would want the recommended course of action and only a small proportion would not.</td>
<td>Most patients should receive the recommended course of action.</td>
<td>The recommendation can be evaluated as a candidate for developing a policy or a performance measure.</td>
</tr>
<tr>
<td><strong>Level 2</strong> “We suggest”</td>
<td>The majority of people in your situation would want the recommended course of action, but many would not.</td>
<td>Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with her or his values and preferences.</td>
<td>The recommendation is likely to require substantial debate and involvement of stakeholders before policy can be determined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Quality of evidence</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>High</td>
<td>We are confident that the true effect lies close to that of the estimate of the effect.</td>
</tr>
<tr>
<td>B</td>
<td>Moderate</td>
<td>The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.</td>
</tr>
<tr>
<td>C</td>
<td>Low</td>
<td>The true effect may be substantially different from the estimate of the effect.</td>
</tr>
<tr>
<td>D</td>
<td>Very low</td>
<td>The estimate of effect is very uncertain, and often will be far from the truth.</td>
</tr>
</tbody>
</table>
AKI Definition

2.1.1 AKI is defined as any of the following (not graded):

- Increase in Serum Creatinine by at least 0.3 mg/dl (26.5 µmol/l) within 48 hours;
- Increase in Serum Creatinine to at least 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days;
- Urine volume below 0.5 ml/kg/h for 6 hours.

Consistent further development from RIFLE and AKIN
### Staging of AKI

<table>
<thead>
<tr>
<th>Stage</th>
<th>Serum Creatinine</th>
<th>Urine output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.5-1.9 times baseline OR at least 0.3 mg/dl (26.5 μmol/l) increase</td>
<td>less than 0.5 ml/kg/h for 6-12 hours</td>
</tr>
<tr>
<td>2</td>
<td>2.0-2.9 times baseline</td>
<td>less than 0.5 ml/kg/h for at least 12 hours</td>
</tr>
<tr>
<td>3</td>
<td>3.0 times baseline OR increase in serum creatinine to at least 4.0 mg/dl (353.6 μmol/l) OR initiation of renal replacement therapy OR in patients below 18 years, decrease in eGFR to less than 35 ml/min/1.73 m²</td>
<td>Less than 0.3 ml/kg/h for at least 24 hours OR anuria for at least 12 hours</td>
</tr>
</tbody>
</table>
Consequences of AKI

1050 patients after myocardial infarction

<table>
<thead>
<tr>
<th>RIFLE Criteria</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>No AKI</td>
<td>895</td>
</tr>
<tr>
<td>AKI</td>
<td>155</td>
</tr>
<tr>
<td>Creatinine ≥ 1.5 times baseline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KDIGO Criteria</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>No AKI</td>
<td>666</td>
</tr>
<tr>
<td>AKI</td>
<td>384</td>
</tr>
<tr>
<td>Creatinine ≥ 1.5 times baseline or</td>
<td></td>
</tr>
<tr>
<td>Increase in creatinine of ≥ 0.3 mg/dl</td>
<td></td>
</tr>
</tbody>
</table>

Rodrigues et al., PlosOne 2013
Consequences of AKI

With and without AKI by RIFLE criteria

30-Days Survival

30-Days to 1-Year Survival

Rodrigues et al., PlosOne 2013
Consequences of AKI

With and without AKI by KDIGO, but not by RIFLE criteria

30-Days Survival

30-Days to 1-Year Survival

Rodrigues et al., PlosOne 2013
ERBP:

- Use of an uniform definition based on urinary output and on changes in serum creatinine (1C)

- 'Shift-based' calculation of urinary output (1C) and use of the ideal weight in calculation diuresis (ungraded)

<table>
<thead>
<tr>
<th>Staging of AKI according to ERBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>
2.1.1 AKI is defined as any of the following (not graded):

a) Increase in SerumCreatinine by ≥0.3 mg/dl within 48 hours; 
b) Increase in SerumCreatinine by ≥1.5 times baseline, which is known or 
   presumed to have occurred within the prior 7 days; 
c) Urine volume <0.5 ml/kg/h for 6 hours.

- First documented serum creatinine value of the episode should be 
  used as 'baseline', rather than historical creatinines or a calculated 
  value (1C)

**Criticism:** Use of historical or calculated creatinine values leads to 
overestimation of baseline renal function

**Contra:** This most likely results in an 'overdiagnosis'

- AKI remains a clinical rather than a laboratory diagnosis. Clinicians must 
  exercise their judgement [...].

Levey, Levin und Kellum, AJKD 2013
ICD-11 Beta Draft (as of 02.09.2014)

HE80.11 Acute kidney injury

Increase in serum creatinine by 0.3 mg/dl or greater within 48 hours;
or
Increase in serum creatinine by 1.5-fold or greater above baseline, which is known or presumed to have occurred within 7 days;
or
Urine volume less than 0.5 ml/kg/h for 6 hours or more.
The cause of AKI should be determined whenever possible. As a minimal work-up, the presence of hypovolaemia, post-renal causes, low cardiac output, use of nephrotoxic agents, acute glomerulonephritis and renal micro-angiopathy as underlying contributors to AKI should be evaluated. (ungraded)

- Identifying the cause of kidney disease is not included in the definition of either CKD or AKI. Identifying CKD and AKI by laboratory data alone risks 'overdiagnosis', but it was the opinion of the work groups that the risk of 'underdiagnosis' was potentially greater.

Levey, Levin und Kellum, AJKD 2013

<table>
<thead>
<tr>
<th>Causes of AKI:</th>
<th>Recommended diagnostic tests:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decreased kidney perfusion</td>
<td>→ Volume status and urinary diagnostic indices</td>
</tr>
<tr>
<td>• Acute glomerulonephritis, vasculitis, interstitial nephritis, thrombotic microangiopathy</td>
<td>→ Urinary sediment examination, serologic and hematologic testing</td>
</tr>
<tr>
<td>• Urinary tract obstruction</td>
<td>→ Kidney ultrasound</td>
</tr>
<tr>
<td>Exposures</td>
<td>Susceptibilities</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>• Sepis</td>
<td>• Dehydration and volume depletion</td>
</tr>
<tr>
<td>• Critical illness</td>
<td>• Advanced age</td>
</tr>
<tr>
<td>• Circulatory shock</td>
<td>• Female gender</td>
</tr>
<tr>
<td>• Burns</td>
<td>• Black race</td>
</tr>
<tr>
<td>• Trauma</td>
<td>• CKD</td>
</tr>
<tr>
<td>• Cardiac surgery (especially with CPB)</td>
<td>• Chronic diseases (heart, lung, liver)</td>
</tr>
<tr>
<td>• Major noncardiac surgery</td>
<td>• Diabetes mellitus</td>
</tr>
<tr>
<td>• Nephrotoxic drugs</td>
<td>• Cancer</td>
</tr>
<tr>
<td>• Radiocontrast agents</td>
<td>• Anemia</td>
</tr>
<tr>
<td>• Poisonous plants and animals</td>
<td>• ...</td>
</tr>
<tr>
<td>• ...</td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td><strong>Individual risk profile</strong></td>
<td></td>
</tr>
</tbody>
</table>

KDIGO: 1B - ERBP: 1C

**ERBP: Emphasis on interdisciplinarity (ungraded)**
The cause of AKI should be determined whenever possible.

Evaluate patients 3 months after AKI for resolution, new onset, or worsening of pre-existing CKD.

We recommend that patients be stratified for risk of AKI according to their susceptibilities and exposures.

Manage patients with AKI according to the stage and cause.

Evaluate patients with AKI promptly to determine the cause, with special attention to reversible causes.

ERBP:

- Assess patients 2 months after AKI to evaluate the completeness of resolution, the detection of new onset CKD or worsening of pre-existing CKD. (1C)

Acute kidney injury – Acute kidney disease – Chronic kidney disease

Previously:

AKI  AKD  CKD

4-6 Weeks

3 Month

Today:
Prevention and therapy of AKI

3.1.1 In the absence of hemorrhagic shock, we suggest using isotonic crystalloids rather than colloids (albumin or starches) as initial management for expansion of intravascular volume in patients at risk for AKI or with AKI. (2B)

ERBP: 1B

 ► No clear evidence for superiority of colloidal solutions!

But: Hints that specific colloids can trigger AKI and additional financial costs.
• Initially (<12 h) an optimal renal perfusion has to be ensured (fluid substitution as required)
• During advanced phases (>12 h) hyperhydration has to be avoided

Cumulative positive fluid balance → increased mortality and inferior clinical prognosis

Bagshaw et al., 2010
Stage-based management of AKI

AKI Stage

High Risk | 1 | 2 | 3
---|---|---|---
Discontinue all nephrotoxic agents when possible
Ensure volume status and perfusion pressure
Consider functional hemodynamic monitoring
Monitor Serum creatinine and urine output
Avoid hyperglycemia
Consider alternatives to radiocontrast procedures

Non-invasive diagnostic workup
Consider invasive diagnostic workup

Check for changes in drug dosing
Consider Renal Replacement Therapy
Consider ICU admission
Avoid subclavian catheters if possible
**Nutrition**

3.3.1 In critically ill patients, we suggest insulin therapy targeting plasma glucose 110-149 mg/dl (6.1-8.3 mmol/l). (2C)

**ERBP:**

- Target value 110-180 mg/dl (2C)
- Implementing this strict glycaemic control only as part of a good functioning glycaemic control protocol, including close monitoring of glycaemia to avoid hypoglycaemia, and the use of flow charts of action. (1A)
**Contrast-induced AKI**

**KDIGO & ERBP:**
Define and stage AKI after administration of intra-vascular contrast media as per recommendations stated before. (not graded)

**ERBP:**
- We recommend that before an intervention which encompasses a risk for CIN, a baseline serum creatinine should be determined. (not graded)
- We suggest that in high-risk patients, a repeat serum creatinine is performed 12 and 72 h after administration of contrast media. (2D)

**KDIGO & ERBP:**
- Evaluate for contrast-induced AKI as well as for other possible causes of AKI. (not graded)
Contrast-induced AKI

4.4.1 We recommend **intravenous** volume expansion with either isotonic sodium chloride or sodium bicarbonate solutions, rather than no i.v. volume expansion, in patients at increased risk for CI-AKI. (1A)

4.4.2 We recommend not using oral fluids alone in patients at increased risk of CI-AKI. (1C)

**ERP**B:

- We suggest using the oral route of hydration, on the premise that adequate intake of fluid and salt are assured. (2C)

Legal coverage?
Contrast-induced AKI

4.4.3 We suggest using oral NAC, together with i.v. isotonic crystalloids, in patients with increased risk of CI-AKI. (2D)

This guideline does not include patients with CKD Stage 5D with relevant diuresis! Potential drops in blood pressure during dialysis? Procedure?
Timing of renal replacement therapy in AKI

5.1.1 Initiate RRT emergently when life-threatening changes in fluid, electrolyte, and acid-base balance exist. (not graded)

5.6.1 Use continuous and intermittent RRT as complementary therapies in AKI patients.

Hemodynamic instability → continuous renal replacement therapy

ERBP: 1A
Anticoagulation for renal replacement therapy in AKI

5.3.2 For patients without an increased bleeding risk or impaired coagulation and not already receiving effective systemic anticoagulation, we suggest the following:

5.3.2.1 For anticoagulation in intermittent RRT, we recommend using either unfractionated or low-molecular-weight heparin, rather than other anticoagulants. (1C)

5.3.2.2 For anticoagulation in continuous renal replacement therapy, we suggest using regional citrate anticoagulation rather than heparin in patients who do not have contraindications for citrate. (2B)
Guidelines for Acute Kidney Injury by KDIGO and ERBP

- Increase in serum creatinine by 0.3 mg/dl in 48 hours or by 1.5 fold in 7 days
- Contrast-induced AKI included
- Consider cause, exposure, susceptibilities of AKI
- Hydration (early substitution, later restriction
- Renal replacement therapy: intermittent heparin, continuous citrate
- Evaluation for CKD
Thank you for your attention

İlginiz için teşekkür ederim