ADQI-IRRIV session: Quality Measures and Prevention in AKI

AKI risk modification quality indexes

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For the ADQI Consensus Group
Quality Improvement Goals for Acute Kidney Injury

Current problems

- Care pathways for AKI are not well defined
- Considerable variability in care
- Institutions do not follow up patients
- Identification of quality indicators and care pathways
- Critical step in improving outcome of patients at risk for AKI

Can we define and measure quality indicators for AKI risk modification?
AKI prevention as a continuous process
Long term goal: integrated workflow

**on admission**
- Assessment of individual risk for AKI

**pre-intervention**
- AKI risk assessment prior to high-risk exposure

**peri-intervention**
- Define protective measures

**post-intervention**
- Assess outcome & quality control
AKI risk modification in the communities

Population
(National monitoring for variation in AKI incidence)

Periodically

High-Risk Population

Acute exposure

Education

Periodically

Medications

Imaging

Surgery

Sick

30 days before exposure

AKI History
Blood Pressure

Kidney Health Assessment (KHA)

CKD/Creatinine
Drugs/Dipstick

Kidney Health Response (4Ms)
Medication adjustment, Minimize exposures, Message care team and patient, Monitor

Klinik für Anästhesiologie, operative Intensivmedizin und Schmerztherapie
Reporting clinical quality measures

Structure (Access)  Process

Outcome  Patient experience
Do quality indicators improve patient outcome? A comparative perspective.

A. ACE Inhibitor or ARB Prescribed for LVSD

B. Beta-Blocker Prescribed at Discharge

C. Antibiotic Administered within 1 Hr before Surgical Incision

D. Antibiotic Discontinued within 24 Hr after Surgery End-Time

Chassin, NEJM 2010; 363:683-688
## Community healthcare standards for AKI

<table>
<thead>
<tr>
<th>Quality Indicators</th>
<th>Structure</th>
<th>Process</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>Trained staff availability</td>
<td>Kidney Health Assessment</td>
<td>Population based AKI incidence</td>
</tr>
<tr>
<td></td>
<td>Laboratory availability</td>
<td>Percentage receiving KHA</td>
<td>Percentage of AKI patients requiring admission</td>
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<tr>
<td></td>
<td>Population-based databases</td>
<td></td>
<td>Proportion of patients with AKI risk exposure</td>
</tr>
<tr>
<td>Resource-limited regions</td>
<td>History/physical,</td>
<td>Physician-dependent, education,</td>
<td>Percentage of patients admitted to hospital/ward/ICU</td>
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<td></td>
<td>Minimal lab tests</td>
<td>SCr, urine dipstick/output</td>
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<tr>
<td></td>
<td>'Self-pay'</td>
<td>No specialists/limited resources and medications sickne</td>
<td>Number of patients presented to outpatient clinics with CAKI</td>
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<tr>
<td>Resource-sufficient regions</td>
<td>'Insurance' pharmacist/case manager</td>
<td>Exposure evaluation (MISS)</td>
<td>Number of AKI stage 1-2-3, QoL, mortality, adverse events, iatrogenic complications, functional status, economic effects</td>
</tr>
</tbody>
</table>

- AKI: Acute Kidney Injury
Primary Prevention – at hospital admission

Hospital admission

Screening for AKI risk

- Serum creatinine
- U-Stix
- Urine output
- Possible diagnostic tests

At risk

Preventive measures
- Context-specific
- RIPC

Screening - who is at risk for AKI?

**Patient characteristics and co-morbidities**
- age and gender (female)
- chronic diseases (lung, heart, liver)
- cancer
- diabetes mellitus
- medical history of acute kidney injury
- neurological or cognitive impairment or disability, which may mean limited access to fluids
  - anemia

**Illness**
- sepsis, shock
- severe diarrhea
- haematological malignancy
- Trauma, burns

**Clinical symptoms and signs**
- hypotension
- oliguria (urine output less than 0.5 ml/kg/hour)
  - hypovolaemia symptoms or history of urological obstruction, or conditions that may lead to obstruction
- symptoms or signs of nephritis (such as edema or haematuria)

**Others**
- use of drugs with nephrotoxic potential within the past week, especially if hypovolaemic, e.g. NSAIDs, aminoglycosides, ACE inhibitors, ARBs and diuretics)
Evaluation of patients at-risk for AKI

When?
- At hospital admission
  - Before high risk procedures
  - After interventions

How?
- Serum creatinine
- U-Stix
- Urine output
- Risk scores/factors
- Diagnostic test (biomarkers)
- Clinical context
- Expert judgement

Rationale
- Changes of serum creatine und/or urine output reflect acute changes in kidney function
- eGFR may not be representative in non-steady state conditions
- New tests (e.g. biomarkers) may be utilized to identify patients developing AKI prior to elevation of creatinine.
- Utilization of these biomarkers may help refine the optimal timing of primary prevention strategies in patients at risk for AKI.
Flow chart of primary patient evaluation

**Hospital admission**
- AKI risk assessment
- Pre-existent condition, e.g. CKD, age
- Current insult, e.g. sepsis
- ‘High risk’  ‘Low risk’  No primary preventive measures
- Primary preventive measures

**During hospital stay**
- Procedures related to AKI risk, e.g. contrast, surgery, nephrotoxic exposure
- AKI risk assessment in all patients
- ‘High risk’  ‘Low risk’  No follow-up
- Follow-up consequence of intervention
Quality indicators for AKI risk profiling

• Proportion of patients screened for AKI risk among all admissions

• Proportion of identified AKI high-risk patients among all screened patients

• Proportion of AKI high-risk exposures among all hospitalized population and all high-risk patients

• Proportion of patients who received an appropriate intervention around a high-risk exposure

• Proportion of patients who developed AKI among all admissions, and all high-risk patients
## Quality indicators for primary AKI prevention

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<tr>
<td>Reporting</td>
<td>Paper-based</td>
<td>Number of high risk procedures total hospital admissions</td>
<td>Incidence of AKI, RRT</td>
</tr>
<tr>
<td></td>
<td>Resource-limited regions</td>
<td></td>
<td></td>
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<tr>
<td>Electronic</td>
<td>Electronic, E-queries, AE-reporting</td>
<td>% compliance reporting:</td>
<td>Rate and severity of AKI, RRT, relationship to risk status and intervention</td>
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<tr>
<td></td>
<td></td>
<td>• Screening/total admission</td>
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<td></td>
<td>• High-risks/screened patients</td>
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<td>• Active surveillance/high-risk patients</td>
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<td>• Primary prevention/high-risk patients</td>
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Secondary prevention of AKI

What are important aspects?

- Clinical context-appropriate treatment
- Timely Evaluation
- Cost effectiveness
- Outcome relevant
# Secondary prevention of AKI

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<tr>
<th>Recognition</th>
<th>Diagnosis and Evaluation</th>
<th>Limiting Severity and Duration of AKI</th>
<th>Prevention avoidable AKI Complications</th>
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<td>AKI stage-dependent threshold met</td>
<td>Nephrotoxin or contributing medication - Poor hemodynamics - Cause-specific diagnosis delayed</td>
<td>AKI has occurred - High frequency of hyperkalemia in patients with AKI - Poor extubation rates in patients with AKI due to volume overload - Adverse drug events</td>
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<td>Context-appropriate Evaluation</td>
<td>“Nephrotoxin Stewardship” - Asses and optimize hemodynamics - Invasive/ noninvasive - Avoid hyperglycemia - Nephrology referral guidelines - Monitoring of kidney function with serum creatinine and urine output</td>
<td>Improved monitoring for complications (e.g. BMP/bicarbonate/phosphorus measurement) - Risk reduction strategies (e.g. reduced K intake, unnecessary maintenance fluids, review of appropriate dosing of meds) - Management of complications (e.g. treatment of hyper K, fluid removal)</td>
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## Action

- Improved frequency of context-appropriate diagnostic evaluation
- Improved recognition of cause-specific AKI
- Improved rates of nephrotoxin alerting/ evaluation/ discontinuance
- Hemodynamic intervention applied
- Improved timeline of cause-specific diagnosis/ interventions
- Reduced duration and severity of AKI (e.g. maximum stage, length, recovery)

## Results

- Process (improved monitoring/detection, reduction in unnecessary K supplementation, med reconciliation/ evaluation)
- Clinical (reduced incidence of severe hyperkalemia, treatment of severe acidosis pH <7.2, less adverse drug events related to inappropriate drug dosing/selection in AKI)
Summary

- AKI is a clinically relevant problem
- Screening tools and standardized measures to reduce the risk for AKI have to be implemented
- The implementation of these processes into clinical routine has to be monitored by quality indicators
- Only implemented and continuously monitored and revised measures will reliably improve patient care to prevent AKI
# Quality indicators for secondary AKI prevention

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<td>EMR, E-alert, Biomarkers, Imaging</td>
<td>Mandate risk-assessment, System-driven identification and prevention</td>
<td>Percentage of patients admitted to hospital/ward/ICU/ specialist unit who develop AKI</td>
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<td><strong>Hospital stay</strong></td>
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<td><strong>Resource-sufficient regions</strong></td>
<td>‘Insurance’ pharmacist/case manager</td>
<td>Specialist-driven/e-alert medication, imaging, surgery, sickness (ICU)</td>
<td>Number of AKI stage 1-2-3, QoL, mortality, adverse events, iatrogenic complications, functional status, economic effects</td>
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Thanks for your attention!

Alexander Zarbock
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- Adverse drug events |
| **Action**        | Context-appropriate evaluation | - “Nephrotoxin Stewardship”  
- Asses and optimize hemodynamics  
  - Invasive/ noninvasive  
- Avoid hyperglycemia  
- Nephrology referral guidelines  
- Monitoring of kidney function with serum creatinine and urine output | - Improved monitoring for complications (e.g. BMP/bicarbonate/phosphorus measurement)  
- Risk reduction strategies (e.g. reduced K intake, unnecessary maintenance fluids, review of appropriate dosing of meds)  
- Management of complications (e.g. treatment of hyper K, fluid removal) |