MULTIDISCIPLINARY CARE OF AKI PATIENTS
CONFUSION MATRIX
Azra Bihorac
AKI CARE IS A CONTINUUM

From Kashani et al, ADQI XXii
MULTIDISCIPLINARY CARE

• When *professionals* from a *range of disciplines* work together to deliver *comprehensive care* that addresses as many of the *patient's needs* as possible.
PROFESSIONALS

- Physicians
- Advanced practitioners (NP and PA)
- Nurses
- Nurse assistants
- Pharmacists
- Dieticians
- Respiratory therapists
- Social workers/Case managers
- EMS
- Clergy
RANGE OF DISCIPLINES

Outpatient
- Primary Care
- Pharmacy
- Nursing Home
- Home Care
- EMS

Nephrology

Inpatient
- Emergency Room
- Operating Room
- ICU
- Pharmacy
- General Ward
**COMPREHENSIVE CARE**

- Single Pathway-Primary disease?
- Joint pathway-Overlap with other diseases and processes
  - Complication or Side-effect?
  - Preventable or Avoidable?
  - Treatable or Curable?
- Context-Specific Goals, Components and Outcomes

Before AKI episode  
During AKI episode  
After AKI episode
Clinical Decision Support for In-Hospital AKI

METHODS

Outcomes were measured pre- and post-implementation of a Clinical Decision Support System (CDSS) for AKI.

Pre-CDSS (12 months):
- 181k patients
- 11.0% clinically diagnosed AKI

Implemented the CDSS

Clinical Decision Support System
- Derives reference serum creatinine from historical values in EMR
- Flags creatinine changes and KDIGO stage

Post-CDSS (24 months):
- 346k patients
- 12.8% clinically diagnosed AKI

OUTCOMES

Outcomes Pre- and Post-CDSS implementation

CONCLUSION

Implementation of a CDSS for AKI resulted in a small but sustained decrease in hospital mortality, length of stay and use of dialysis.

Al-Jaghbeer & Kellum, JASN 2018;29:654.
## Use of Nephrotoxic Drugs

<table>
<thead>
<tr>
<th>Medication</th>
<th>AKI, n=15,229</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-CDSS, n=4655</td>
</tr>
<tr>
<td>ACEI/ARB</td>
<td>2.20±7.33</td>
</tr>
<tr>
<td>NSAID</td>
<td>4.55±9.52</td>
</tr>
<tr>
<td>Aminoglycoside</td>
<td>0.84±5.98</td>
</tr>
<tr>
<td>Contrast</td>
<td>0.55±1.95</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>4.56±10.38</td>
</tr>
</tbody>
</table>
COMPUTER DECISION SUPPORT SYSTEM FOR DETECTION OF AKI

Detect: biochemical changes of AKI
Alert: generated and seen
Respond: with clinical actions

EHR

No increase in consult rate for Nephrology, ICU and Pharmacy

Selby NM & Fluck RJ, JASN 2018;29:352-354
Tackling AKI Study: Organisational Level Interventions for Acute Kidney Injury

**METHODS:**
Multicentre stepped-wedge cluster randomised trial.

Intervention: hospital-wide AKI e-alerts, care bundle and education.

24,059 AKI episodes
5 hospitals

**OUTCOMES:**

- 30-day mortality
  (Primary outcome)

- AKI progression

- Hospital length of stay
  (in those with longer LoS)

- AKI incidence
  (improved detection)

- Delivery of AKI care

**CONCLUSION:** A complex, hospital-wide intervention for AKI did not alter mortality but reduced hospital length of stay, whilst improving quality of care and AKI recognition.

Selby NM et al, JASN 2019;30:505
INTERVENTION

- An AKI electronic detection and alerting system - UNIFORM in UK, laboratory digital data
  - Stage of AKI with message advising a clinical response/review of the patient and sign posting of local AKI resources
  - Disruptive element - biochemist telephone to the clinical areas for AKI stage 2/3

- An AKI care bundle

<table>
<thead>
<tr>
<th>Core Elements of the AKI Care Bundle Common across All Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess volume status and optimize BP</td>
</tr>
<tr>
<td>Treat sepsis</td>
</tr>
<tr>
<td>Review medications and stop those contributing to AKI</td>
</tr>
<tr>
<td>Perform urinalysis</td>
</tr>
<tr>
<td>Referral (to nephrology or critical care outreach) for AKI stage 3, AKI with complications</td>
</tr>
</tbody>
</table>

- An educational program to raise awareness and knowledge of AKI.

Selby NM et al, JASN 2019;30:505
<table>
<thead>
<tr>
<th>Type of Education Session</th>
<th>No. of Sessions per Center</th>
<th>Target Audience</th>
<th>Audience Size</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Launch event</td>
<td>1</td>
<td>All members of staff welcome; hospital chief executive, medical director, chief nurse attended</td>
<td>30–50</td>
<td>1 h</td>
</tr>
<tr>
<td>Hospital grand rounds</td>
<td>2</td>
<td>All grades of physicians, doctors in training and open to those in other specialties who wish to attend</td>
<td>40–80</td>
<td>1 h</td>
</tr>
<tr>
<td>Departmental educational or clinical governance meetings</td>
<td>3–8</td>
<td>Departmental teaching to a range of specialties (e.g., emergency medicine, acute medicine, surgery, urology, rheumatology, elderly care)</td>
<td>10–20</td>
<td>1 h</td>
</tr>
<tr>
<td>Postgraduate teaching for doctors in training</td>
<td>3/yr (1 for each grade of doctor)</td>
<td>AKI teaching as part of curriculum (essential teaching) for doctors in training, attendance often mandatory</td>
<td>20–40</td>
<td>1–2 h</td>
</tr>
<tr>
<td>Induction teaching for new staff</td>
<td>1–3</td>
<td>Shorter sessions, more focused on process rather than education per se</td>
<td>20–40</td>
<td>15 min</td>
</tr>
<tr>
<td>Nursing, pharmacy, and advanced practitioner teaching</td>
<td>2–3</td>
<td>Varied between centers from small group teaching to formal AKI study day for large groups</td>
<td>5–70</td>
<td>1 h to whole day</td>
</tr>
<tr>
<td>Ward-based teaching sessions</td>
<td>5–10</td>
<td>Formal teaching sessions at ward level</td>
<td>1–10</td>
<td>5–30 min</td>
</tr>
<tr>
<td>Ad hoc teaching sessions</td>
<td>20+</td>
<td>Informal teaching delivered by various members of the AKI team, included reminders of resources, patient-based teaching</td>
<td>1–3</td>
<td>Varied, usually only minutes</td>
</tr>
</tbody>
</table>
REDUCTION IN LENGTH OF STAY

Selby NM et al, JASN 2019;30:505
CHANGE IN PROCESSES OF CARE

Selby NM et al, JASN 2019;30:505
ORGANIZATIONAL LEVEL INTERVENTION FOR DETECTION OF AKI AND IMPLEMENTATION OF BEST PRACTICE SUPPORTIVE CARE

Digital data
Computable Phenotype

+/− Nephrology
PI-led education and care bundle

Selby NM et al, JASN 2019;30:505
MANAGEMENT OF AKI
A NUDGE TO HACK NEW HABIT

- **Detect**: biochemical changes of AKI
- **Alert**: generated and seen
- **Respond**: with clinical actions

**Nudge**
Improving Decisions About Health, Wealth, and Happiness

**New Habit Care Bundle**

**ATTENTION MANIPULATION**
PREVENTION OF AKI

• ICU patients
• Context-Specific Goals, Components and Outcomes
Non-Cardiac High Risk Surgery
237 tested
125 T2I7 + (53%)

Randomized:
63 intervention
62 control

Intervention:
1. Nephrology Consult
2. CVP guided IV fluid
3. Nephrotoxic drugs

High risk for AKI
Elective surgery > 4 hrs

AND

Age>75 or
ICU or
CKD or
Contrast during surgery

Nephrology Recommendations
1. Nephrotoxic medications 35%.
2. Higher MAP target levels 10%.
3. Acid-base/albumin/electrolytes 53%
Cost savings of 2031 euros per patient getting 2 tests.

Gocze, Ann Surg 2018
DO BETTER? COMBINE TESTS!

“AND rule” Increase Specificity
Test is positive, if both are positive
Test is negative, if either test is negative

\[
\text{SpeC (Combo Test) } = \text{SpeC}_1 + \text{SpeC}_2 - \text{SpeC}_1 \times \text{SpeC}_2 \\
\text{SenS (Combo Test) } = \text{SenS}_1 \times \text{SenS}_2
\]
ORGANIZATIONAL LEVEL INTERVENTION FOR AKI PREVENTION

Nephrology led education and care bundle

Detect AKI risk

Alert

Respond with standardized bundle

Reinforce

New Habit Care Bundle

KDIGO
Improved predictive models for acute kidney injury with IDEA: Intraoperative Data Embedded Analytics

Lasith Adhikari2,7, Tezcan Ozrazga-Baslan4,2, Matthew Ruppert1,2, R. W. M. A. Madushani3,2, Srijan Palival1,2, Haleh Hashemi-Ghouchani1,2, Feng Zheng3,9, Ming Tao9, Juliano M. Lopes5, Xiaolin Li8, Parisa Rashidi4, Azra Bhorac2,7.

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DeepSOFA: A Continuous Acuity Score for Critically Ill Patients using Clinically Interpretable Deep Learning

Benjamin Shickel, Tyler J. Loftus, Lasith Adhikari, Tezcan Ozrazag-Badanti, Azra Bihorac, and Parisa Rashidi
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