Temporal Trends in the Incidence of Acute Kidney Injury in Patients with Acute Myocardial Infarction

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BACKGROUND

- Acute kidney injury (AKI) is common in acute myocardial infarction (AMI) patients.
- Current rates of AKI are approximately 20% (1 in 5) AMI patients.
- AKI during AMI hospitalization is associated with a substantial hazard of both morbidity and mortality.
- Due to prognostic importance and clinical impact of AKI, many recent studies as well as ACCF/AHA/SCAI clinical guidelines have emphasized the importance of its prompt recognition and prevention.
- Whether these efforts have translated into lower AKI rates over time is unknown.

OBJECTIVES

- To examine the temporal trends in the incidence of AKI in patients hospitalized with AMI from 2000 to 2008.
- To examine if these trends are different in patients undergoing cardiac catheterization vs. not.
- To identify if trends in the use of medications affecting renal function have changed over time.

METHODS

Data Source

- We used the Cerner Corporation's Health Facts - a national database with detailed information on in-hospital renal function.
- We studied 34,780 encounters in 32,870 patients, hospitalized with AMI in 56 U.S. centers from 2000-08.

Inclusions

- Primary Discharge diagnosis of AMI (ICD-9 code 410)
- At least one documented abnormal troponin I or T, or CK-MB fraction
- At least two creatinine measurements during hospitalization.

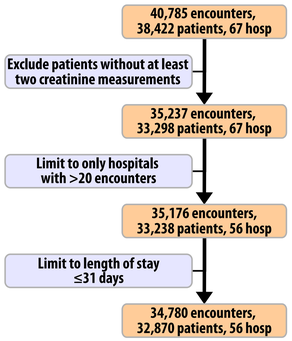
AKI Definition

- AKI was defined as absolute creatinine increase of ≥ 0.3 mg/dL or a relative increase of ≥50% from the admission value.

Statistical Analysis

- Temporal trends in AKI during the 9-year study period were evaluated using hierarchical logistic regression, adjusting for secular changes in baseline creatinine and other known AKI predictors.

Exclusions



Covariates

- Age (per incremental 10 years)
- Gender
- Race (White vs. Non-white)
- Congestive heart failure
- Cardiogenic Shock
- GFR (per incremental 30 pt change)
- CABG
- Diabetes

Stratified Analyses

- Cardiac catheterization group
- No catheterization group

RESULTS

Table 1: Baseline Characteristics

	n = 34780
Age	69.0 ± 14.1
Female gender	14477 (41.6%)
ST-Elevation MI	12509 (36.0%)
AKI	8480 (24.4%)
Heart failure	12045 (34.6%)
PVD	940 (2.7%)
CKD	4329 (12.4%)
End stage renal disease	1200 (3.5%)
Diabetes	9257 (26.6%)
In hospital CATH	21942 (63.1%)
In hospital PCI	13716 (39.4%)
In hospital CABG	3838 (11.0%)
Admission creatinine (Median (IQR))	1.1 (0.9, 1.5)
Mean creatinine (Median (IQR))	1.1 (0.9, 1.5)
Max creatinine (Median (IQR))	1.3 (1.0, 1.8)
GFR by MDRD (Median (IQR))	63.0 (43.8, 81.3)
LOS (Median (IQR))	115.7 (73.1, 190.9)
ACE inhibitors or ARBs	22286 (64.1%)
NSAIDS	2346 (6.7%)
Diuretics	17683 (50.9%)
Sodium Bicarbonate	4346 (12.5%)
N-Acetyl Cysteine	2548 (7.3%)

Figure 1: Unadjusted trends in the incidence of AKI

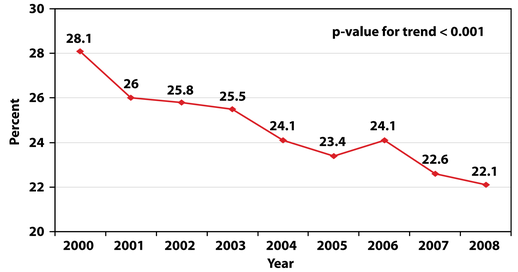


Figure 2: Unadjusted trends in the incidence of AKI by Catheterization vs. No catheterization groups

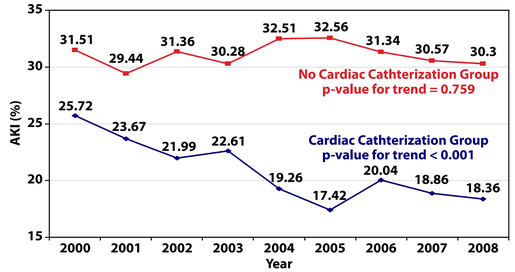


Figure 3: Adjusted trends in the incidence of AKI

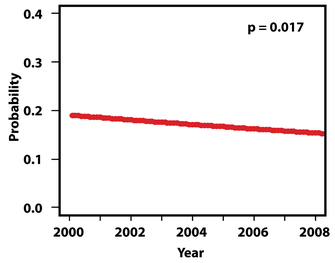


Figure 4: Adjusted Trends in AKI, in patients undergoing Catheterization vs. No Catheterization

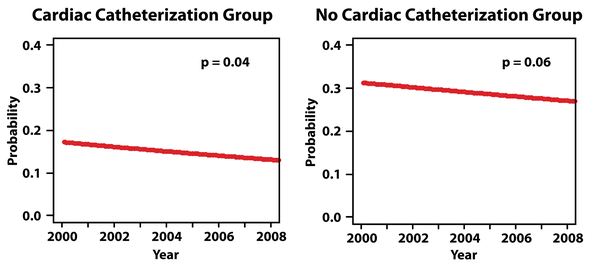
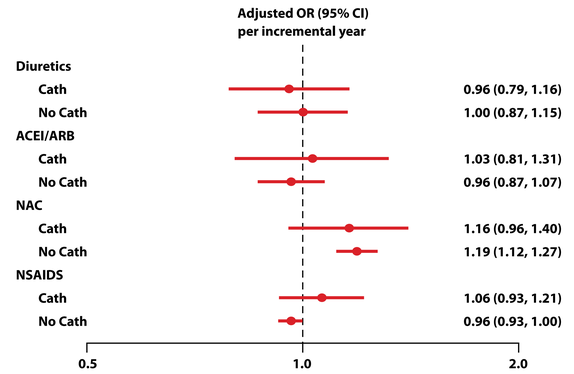


Figure 5: Adjusted Trends in the use of Medications Influencing AKI



- Among 34,780 encounters, the overall incidence of AKI was 24.1%.
- The incidence of AKI decreased significantly over time (Fig 1 and 3).
- Most of this effect was attributable to the decline in AKI among patients undergoing coronary angiography (Fig 2 and 4).
- When adjusted for change in AKI risk factors over time, these findings persisted - OR 0.97 , 95%CI 0.94 -0.99 per year. (Fig 3).
- The declines in AKI over time did not appear to be due to the changes in the use of medications that affect renal function (Fig 5).
- However, observed increase in the use of N-Acetyl cysteine suggests that clinicians are paying more attention to AKI prevention. Furthermore, other factors, such as hydration and limitation of contrast volume may be contributing the reduction of AKI.

CONCLUSIONS

- In a nationally-representative AMI database, we found a significant decline in AKI between 2000 to 2008, despite concomitant increase in risk factors.
- This decrease in AKI was most apparent in patients undergoing coronary angiography.
- While not definitive, these data suggest that greater clinician awareness and AKI preventative efforts over time are likely contributing to these trends.
- Future efforts need to focus on evaluating which specific processes of care are most effective in reducing in-hospital AKI among patients with AMI.