Impact of Using Automated Electronic Alert on Acute Kidney Injury Outcomes Systematic Review and meta-analysis

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BACKGROUND

- Acute kidney injury AKI is becoming more widely recognized as a serious public health issue, particularly in developing countries since AKI affects over 133 million people each year, electronic alerts (e-alerts) are being used in different settings to enhance detection and effective management but the main impact on patient's health care outcome still uncertain.
- Therefore, we propose to conduct an evidence synthesis and to describe the various e-alerts systems for AKI detection, and to assess their impact for patient care, outcomes and resource use

METHODS

Study Design:
Systematic review and meta-analysis following PRISMA guidelines.
Data Sources:
Searches were conducted in PubMed, Cochrane Library, and EBSCOhost, covering studies from 2000 to 2023.
Inclusion Criteria:
Randomized controlled trials (RCTs) investigating e-Alerts for AKI based on KDIGO criteria in hospitalized adults.
Outcomes Evaluated:
= **Primary Outcomes:** Mortality, dialysis, and AKI progression.
= **Secondary Outcomes:** Resource utilization (e.g., nephrology consultations, medication adjustments).

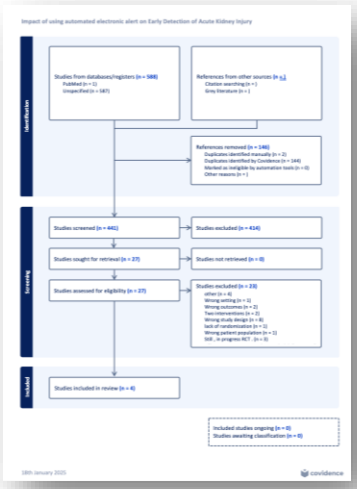
RESULTS

Detect

Alert

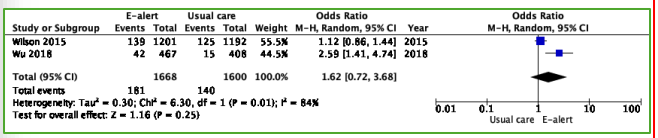
Respond

A total of 588 records were identified through systematic database searches. Following title and abstract screening, 27 full-text articles were assessed for eligibility. Ultimately, four studies were included in the final analysis, including the pivotal study by Wilson et al., 2023. The study selection process is illustrated in the PRISMA flow diagram .

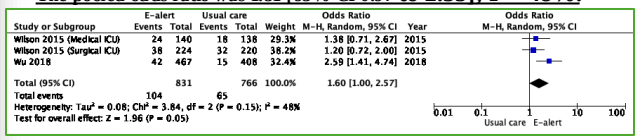


Meta-Analysis results in Forest plots explained

➢ **Nephrology consultation During hospital admission; 2 studies with 3268 Pts. The pooled odds ratio was 1.62 [95% CI 0.72 to 3.68]; $I^2 = 84\%$**



➢ **Nephrology consultation comparison in the ICU, 2 studies with 1597 Pts. The pooled odds ratio was 1.51 [95% CI 0.97 to 2.35]; $I^2 = 48\%$.**



- **Mortality:** Analysis revealed no significant improvement in mortality outcomes with the use of e-alerts compared to usual care. (RR = 1.02, 95% CI 0.88–1.17).
- **Dialysis**: E-alerts did not reduce the risk of renal replacement therapy (RR = 1.16, 95% CI 0.96–1.42).
- **AKI Progression:** The benefits of e-alerts on AKI progression were limited.

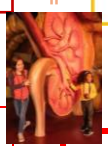
- **Nephrology Consultation**: Pooled analysis showed significant heterogenicity between the e-alert group and usual care, pooled odds ratio was 1.62 [95% CI 0.72 to 3.68]; I2 = 84%.

Medication Discontinuation: The alerts improved medication discontinuation, rates (61.1% vs. 55.9%, p = 0.0003)

Author	Title	Year	Country	Study setting	Study period	Study design	Population & sample size	Conclusion
(Wilson et al., 2015)	Automated, electronic alerts for acute kidney injury: A single-blind, parallel-group, randomised controlled trial	2014	Philadelphia, PA, USA	University of Pennsylvania in Philadelphia, PA, USA	Between Sept 17, 2013, and April 14, 2014	Investigator-masked, parallel-group, randomized controlled trial	participants were adults aged 18 years or older who were in the hospital with stage 1 or greater acute kidney injury 1201 alert group and 1192 were assigned to the usual care group	this randomised, controlled study did not show a meaningful benefit of an electronic alert system for acute kidney injury in patients in hospital.
(Wu et al., 2018)	Value of electronic alerts for acute kidney injury in high-risk wards: a pilot randomized controlled trial	2018	China	intensive care units (ICUs), cardiology divisions (right divisions), coronary care units (CCUs) and cardiac surgery divisions (four wards)	from July 1 to November 31, 2016	A prospective, randomized, controlled study	Patients were assigned randomly to an e-alert group (467 patients) or a non-e-alert group (408 patients).	The e-alert system described here was a reliable tool to make an accurate diagnosis of AKI.
(Perry Wilson et al., 2021)	Electronic health record alerts for acute kidney injury: Multicenter, randomized clinical trial	2020	Connecticut and Rhode Island, US	Six hospitals (four teaching and two non-teaching)	4 May 2018	Double blinded, multicenter, parallel, randomized controlled trial.	6030 adult inpatients with acute kidney injury; alert care 3059, usual care 2971	Alerts did not reduce the risk of our primary outcome among patients in hospital with acute kidney injury. The heterogeneity of effect across clinical centres should lead to a re-evaluation of existing alerting systems for acute kidney injury.
Perry Wilson et al., 2023	A randomized clinical trial assessing the effect of automated medication-targeted alerts on acute kidney injury outcomes	2023	USA	National Institutes of Health (NIH) hospitals	August 16, 2020 to November 29, 2021,	Open-label, NIH-funded, parallel group randomized controlled trial	1060 hospitalized adults with acute kidney injury and active prescriptions for nephrotoxic medications (NSAIDs, RAAS inhibitors, PPIs). 61.1% of medication discontinuation in the alert group vs 55.9% in usual care.	Medication-targeted alerts improved discontinuation rates of nephrotoxic medications but showed no significant impact on progression of acute kidney injury, dialysis, or mortality outcomes.

DISCUSSION

- Our systematic review found the introducing of electronic alert for AKI had a modest effect on secondary health care services and no effect on the risk of progression of acute kidney injury, dialysis, or death.
- Potential for alert fatigue and inconsistent clinical adherence.
- Our review highlights significant proplem which is knwledge gap related to the tackling of e-alert and its implementation toward AKI management.
- The impact of e-alerts on processes of care appears variable, reflecting defeasances in alert type, degree of integration with health care processes and the context in which they are applied



CONCLUSION AND RECOMMENDATION

- Before drawing definitive conclusions regarding E-alert efficacy and effectiveness, further high-quality research(mixed-method research) and rigorous studies are required to strengthen the evidence base.
- An important domain before implementation of e-alert resembling in doing ARA (AKI Risk Assessment), all patents who develop AKI already has risk factors... so we must be proactive not reactive mind.
- Providing targeted training on AKI management and e-alert usage, alongside routine feedback about the alerts' impact on patient outcomes.

LIMITATIONS

- ❑3 of RCT was done in the same country.
- ❑3 RCT was done by the same resercher.
- ❑ We were unable to perform significant pooled analyses for all outcomes.

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