Characterising acute kidney injury using a linked clinical database

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Abstract

Background: Early recognition and management of acute kidney injury (AKI) is necessary to minimise preventable harm and high healthcare costs. NHS England has instigated dissemination of a national AKI algorithm based on changes in serum creatinine, to generate alerts and facilitate earlier detection of AKI and improved clinical care. We aimed to assess the feasibility of reproducing AKI alerts in routine data and to compare the characteristics and associations of not-admitted community-acquired AKI (not-admitted CA-AKI), admitted community-acquired AKI (admitted CA-AKI) and hospital-acquired AKI (HA-AKI).

Methods: Using data from the Hampshire Health Record Analytics Database (UK), an anonymised data resource linking primary and laboratory data, we applied the NHS AKI algorithm to those with two or more creatinine measurements to identify individuals (out of an eligible population of 642,337 individuals) who developed AKI during 2014. Descriptive statistics and multivariable logistic regression models were used to compare characteristics of CA-AKI (admitted and not admitted) and HA-AKI, adjusting for age, sex, socioeconomic status, co-morbidities and prescribed medication. Cox proportional models were used to compare 1 year mortality outcomes.

Results: Incidence rate of generating at least one AKI alert in our population was 835 per 100,000 adults per year. 1,652 (30.8%) individuals who generated an alert were not-admitted CA-AKI, 1,980 (36.9%) individuals were admitted CA-AKI (either identified on admission or admitted within 7 days of generating the alert), 1,654 (30.9%) individuals were HA-AKI, and 75 (1.4%) were classified as 'undetermined in-hospital' alerts. Being older, living in a deprived area, having hypertension, diabetes, chronic kidney disease, heart failure, cardiovascular disease and being prescribed diuretics were independent risk factors for both CA-AKI and HA-AKI. Female sex and renin-angiotensin aldosterone system inhibitors were associated with not-admitted CA-AKI but not admitted CA-AKI or HA-AKI. Compared to admitted CA-AKI and HA-AKI, not-admitted CA-AKI had lower rates of repeat blood tests within 90 days (79% and 82% vs 64%, $p<0.001$), showed lower AKI stage progression (10% and 13% vs 5%, $p<0.001$) and lower rates of full creatinine recovery at 90 days (54% and 49% vs 32%, $p<0.001$). 1 year survival was worse for those with admitted CA-AKI or HA-AKI (adjusted hazard ratio 1.83 [CI: 1.49-2.24] and 1.71, [CI: 1.39 – 2.11] respectively) compared to not-admitted CA-AKI.

Conclusions: It is possible to reproduce alerts in this large linked database. AKI is common, most originates in the community and a significant proportion (31% of all people with AKI) is not-admitted. The study identified the characteristics of individuals at risk of CA-AKI in primary care who may benefit from monitoring of blood tests, indicates important

differences in outcomes for not-admitted CA-AKI, admitted CA-AKI and HA-AKI and highlights the scope NHS AKI alerts to improve outcomes and costs associated with AKI.