Reporting the rate of Acute Kidney Injury (AKI) within England – the current state of the NHS AKI Master Patient Index and Registry

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1. Background

- Acute kidney injury is common in admitted patient care and represents a significant cause of mortality and morbidity.[1]
- There is evidence that it is not well treated in up-to one third of cases.[2]
- Single centre measurement of quality and outcome give a understanding of the problem, but not a measure of national variation.[3]
- A previous audit of care and outcomes in acute NHS trusts did suggest significant variation exists but was time limited in duration.[4]

2. The mandate to develop a system for national comparison of AKI

NHS England issued a level 3 patient safety alert to improve care for people with Acute Kidney Injury (AKI)[5]. The alert mandated and standardised the biochemical classification of AKI and required NHS trusts within England and biochemistry departments to submit data on AKI warning test scores to the UK Renal Registry (UKRR) starting in April 2015.

3. Defining AKI warning test scores

The NHS Patient Safety Alert adopted an algorithm to produce an 'AKI warning test score', based on changes in serum creatinine, a routinely performed measure of kidney function[6]. AKI is divided into three stages (1-3) based on how much a blood test of kidney function has changed in the previous few days, with stage 3 being the most severe stage. This classification is based upon the KDIGO AKI staging system[7] using only changes in blood tests. It has been externally validated with a high degree of sensitivity and specificity[8]. The output of the algorithm generates an AKI warning test result which requires clinical evaluation but provides a suitable marker of population levels of AKI.

In addition, the interpretation of AKI episodes requires additional rules to clarify whether the result is related to an ongoing episode of AKI or is a new episode. The UK Renal Registry have adopted an approach consistent with other UK investigators and report the highest stage of AKI result for each patient during an AKI episode. After a period of 90 days without an AKI warning test score for an individual then a new AKI warning test score is considered to be a new episode of AKI for that person.

The UKRR receives data on both adults (age ≥ 18 years) and children (age < 18 years) and perform analysis separately for each group. The data presented in this report represents the findings in adults unless otherwise stated.

4. Establishing an AKI master patient index

As part of the NHS England safety alert, the UKRR established an AKI master patient index. The purpose of this was to allow the creation of a Registry through data linkage to inform research, improvement and commissioning across the population. The UKRR has permission from the Confidentiality Advisory Group of the Health Research Authority to collect data on AKI without individual consent under section 251 of the Health and Social Care Act. Each month, a laboratory generates a file of AKI warning test results and transmits those data to the UK Renal Registry. Within England 158 laboratories are analysing serum creatinine from patients undergoing acute care. The number of laboratories submitting data to the UK renal registry has been steadily increasing with time (Figure 1). After initial rapid uptake since January 2017 approximately four additional laboratories submit data each month.

At the end of November 2017 137 (more than 85% of) laboratories have now sent at least one AKI file to the UK Renal Registry, and all but two of the remainder are in discussion with the UKRR about how to submit files.
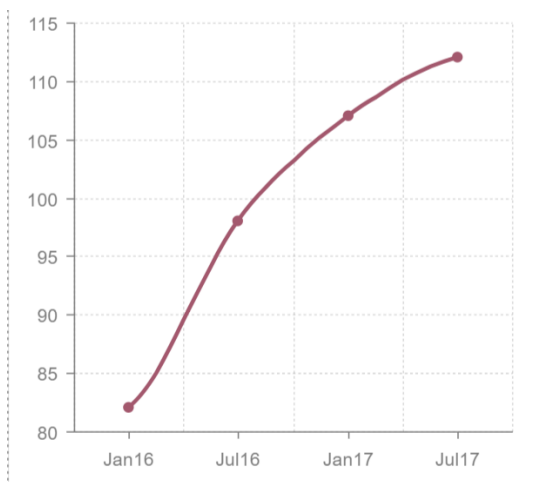

Figure 1: Number of laboratories returning data on patients with AKI with time.

5. What do we now know about AKI in England?

Over the eighteen months April 2016 – September 2017 there were 532,469 AKI episodes reported to the UK Renal Registry. The majority were for AKI stage 1 (**Figure 2**).
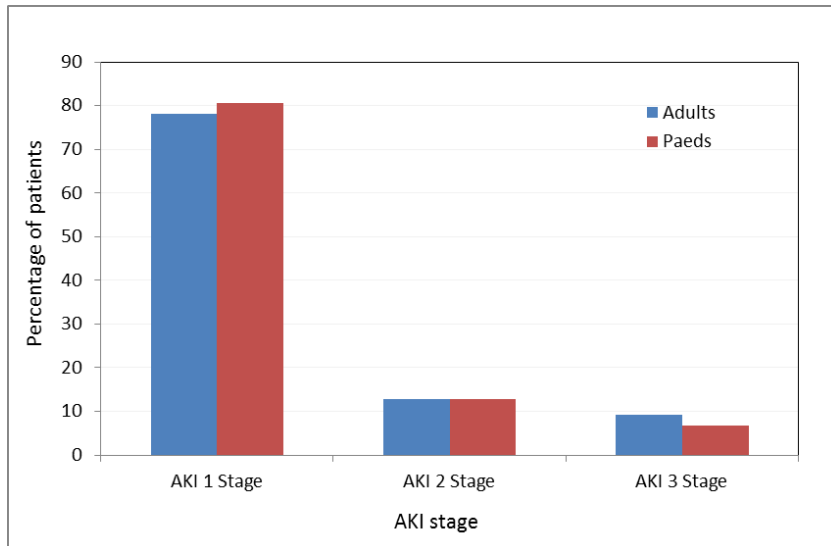

Figure 2: Percentage of AKI warning test scores by AKI stage for Adults and Children

The median age of adult patients is approximately 74 years and for children 2 years. Age does not appear to vary significantly between AKI alert stages.

Using all the AKI episodes from the last 12 months the overall age and sex standardised thirty-day mortality was 17%, and increased with AKI stage (Table 1).

AKI stage	N	Crude mortality (%)	Adjusted for age and sex (%)
1	247,755	13.31	12.15
2	61,470	28.15	25.37
3	51,681	28.92	27.25
Total*	360,906	18.07	17.02

*The total number of warning test scores is lower than the total number of AKI warning test scores that have been reported to the UKRR because of missing data in the mortality adjustment

Table 1: Number of AKI episodes by stage of AKI, and 30-day mortality (July 16 to June 17)

6. Reporting AKI episode rates to CCG

For the first time in October 2017 the UKRR sent an individualised report to every CCG in England giving information about how they were performing with AKI reporting. Reporting AKI rate is graded by the confidence in the AKI rate as Green, Amber and Red. The process for determining confidence is shown in Table 2:

GREEN - where we are confident that all the labs serving this CCG population provided data for this period. This means that all labs in the CCG, and all labs in neighbouring CCGs, provided data. This is likely to be the real rate of AKI warning test scores in the CCG population during these three months.

AMBER - where only some of the labs serving this CCG population provided data for this period. The labs within the CCG provided data but not all the neighbouring CCG labs. Data for people living towards the boundaries of the CCG may well be missing. This means that the score is likely to be an under-estimation of the real rate of AKI warning test scores in the CCG population during these three months.

RED - where we have little or no data from the labs covering the CCG population for this period. This is because at least one of the labs within the CCG has not provided data. This means that the score is likely to be a significant under-estimation of the real rate of AKI warning test scores in the CCG population during this quarter.

Table 2: Confidence categories for CCG level AKI warning test score rate reporting

Between July and September 2017 51 CCG had an AKI rate which was reported at the highest (Green) level of confidence, and 109 with an Amber rate of confidence. The 51 green CCG cover a population (18+) of 9.1 million people, and the amber CCG an additional 21.6 million from a total England population (18+) of 43.5 million (71% population coverage).

There was considerable variation in AKI rate within both green and amber groups. The concern over reporting an AKI rate for those of amber confidence is the potential to under-report the real rate of AKI (because of incomplete coverage of the population if a close-by laboratory is not reporting). Despite this concern several of the amber confidence CCG had rates of AKI higher than the range of the 51 CCG green confidence group.

Despite adjustment for age and sex therefore it is clear that there is substantial variation in the rate of AKI across England and Wales, which is unlikely to be explained (or reduce) as coverage improves.

The range of AKI rates for those of Green confidence are shown in the funnel plot (Figure 3). The rate of AKI amongst the 51 green confidence CCG was 2,600 per million population (95% CI 2,500 to 2,600). The rates shown are for a three-month period so are approximately one-quarter the rate that would be expected for over a complete year.
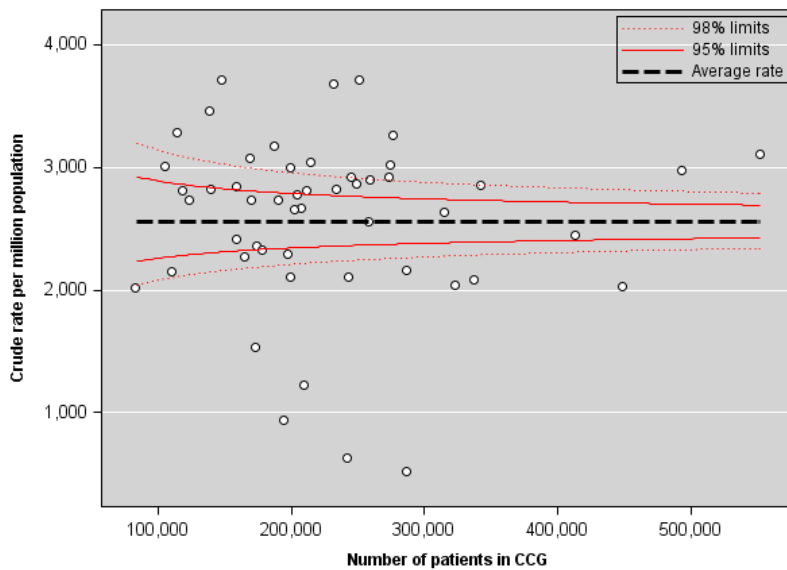
Figure 3: Funnel plot of the rates of AKI amongst CCG with a Green (high) confidence of complete coverage

There is a now a rolling programme to publish quarterly AKI rate by CCG every three months covering a period of time three months in arrears (to allow laboratories time to transmit results files).

7. Reporting AKI rate by secondary care provider: moving from Master Patient Index to Registry

The UK Renal Registry will link the AKI master patient index to the Hospital Episode Statistics (HES) for England and Wales and will publish a rate of AKI for acute NHS trusts (provided the pathology laboratory for that organisation is sending AKI results files to the UK renal registry). As well as being a potential key measure of care quality in the organisation, it will further incentivise any remaining laboratories to improve AKI data reporting.

A large number of acute NHS trusts have already implemented programmes to identify AKI early and improve the care that these patients receive. The serial publication of AKI rate by organisation, along with the direct comparison with similar local or national organisations will identify areas where future improvement is required, and provide evidence for the effectiveness of any improvement strategy.

8. Future collaborations

The UK Renal Registry is an established partner in the Public Health England hosted National Cardiovascular Intelligence Network (NCVIN). NCVIN are exploring developing the PHE fingertips tool (data portal) to incorporate indicators across the entire kidney disease pathways including AKI. This will allow commissioners and others to see local data on AKI in the context of wider kidney disease and assess local kidney needs and outcomes across the entire pathway.

Specialised Commissioning is responsible for organising care for people with AKI who require acute renal replacement therapy (RRT - haemofiltration or dialysis). Such people (who by definition have the most severe stage of AKI) have a high mortality. Some go on to develop chronic kidney disease (CKD) following AKI with an increased lifetime risk of premature cardiovascular disease, and a small number continue to require long-term dialysis at significant expense. Linkage of the AKI master patient index with HES, and the UKRR chronic dialysis dataset will allow comparison of all these outcomes of AKI in addition to the current outcome measure of mortality.

NHS Rightcare produce a series of information resources to support CCG in local improvement, and also employ a team of local delivery partners to support local teams. AKI (both in and out of hospital) represents an obvious opportunity to improve patient outcome, but also to reduce inefficiency and cost. Several high quality improvement projects have been completed and published, demonstrating improved outcomes and reduced length of stay for people with AKI [9,10] A recent multicentred quality improvement programme has also just completed[11]. All have been consistent in suggesting meaningful reductions in median length of stay of between 1-2 days for individuals with AKI. Extrapolated across England, this could result in 0.5 – 1 million bed days per annum saved and a minimum of £100 million expenditure.

9. Summary

- More than 85% of England and Wales biochemistry laboratories have provided at least one AKI results file to the UK Renal Registry, and 110 of 158 are now doing so routinely. The UK Renal Registry has effective strategies in place to target key missing laboratories with links to all but two labs, resulting in a progressive increase in reporting.
- Novel reporting strategies have allowed the UK Renal Registry to report to individual CCG their AKI rate for the first time. The individualised report also provided a measure of the confidence in the rate, and how they compare to other CCG, along with a summary of the National picture and significant AKI associated mortality. This is now part of a quarterly rolling report to each CCG on their rate of AKI.

- It is clear that there is significant variation in the rate of AKI across England and Wales not explained by age and sex. This variation is unlikely to reduce with increases in the labs submitting AKI results and remains an important focus for quality improvement activity.

- Having an acute kidney injury warning test score is associated with a significant 17% mortality at 30 days. The risk of dying increases with the stage of AKI and age.

- The UK Renal Registry will link AKI episodes to Hospital Episode Statistics which will allow acute care providers to compare their AKI rate between similar organisations and over time. As well as identifying key areas for quality improvement it will further incentivise laboratory reporting of AKIs.

- Using the existing strong links that the UKRR has with other organisations including the PHE NCVIN there is scope to incorporate key measures of AKI rate and outcome in wider health and value improvement.

10. References

1. Selby, N. M. *et al.* Use of electronic results reporting to diagnose and monitor AKI in hospitalized patients. *Clin. J. Am. Soc. Nephrol. CJASN* **7,** 533–540 (2012).

2. NCEPOD - Acute Kidney Injury: Adding Insult to Injury Report (2009). Available at: http://www.ncepod.org.uk/2009aki.html. (Accessed: 29th November 2017)

3. Porter, C. J. *et al.* A real-time electronic alert to improve detection of acute kidney injury in a large teaching hospital. *Nephrol. Dial. Transplant.* **29,** 1888–1893 (2014).

4. Medcalf, J. F., Davies, C., Hollinshead, J., Matthews, B. & O'Donoghue, D. Incidence, care quality and outcomes of patients with acute kidney injury in admitted hospital care. *QJM Mon. J. Assoc. Physicians* **109,** 777–783 (2016).

5. NHS England » Acute Kidney Injury (AKI) Safety Alert. Available at: https://www.england.nhs.uk/2014/06/psa-aki/. (Accessed: 29th November 2017)

6. NHS England » Acute Kidney Injury (AKI) Algorithm. Available at: https://www.england.nhs.uk/akiprogramme/aki-algorithm/. (Accessed: 29th November 2017)

7. Kidney Disease: Improving Global & Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO Clinical Practice Guideline for Acute Kidney Injury. *Kidney Int.* **Suppl.,** 1–138 (2012).

8. Sawhney, S. *et al.* Maximising Acute Kidney Injury Alerts – A Cross-Sectional Comparison with the Clinical Diagnosis. *PLOS ONE* **10,** e0131909 (2015).

9. Ebah, L. *et al.* A Multifaceted Quality Improvement Programme to Improve Acute Kidney Injury Care and Outcomes in a Large Teaching Hospital. *BMJ Open Qual.* **6,** u219176.w7476 (2017).

10. Chandrasekar, T. *et al.* A whole system approach to improving mortality associated with acute kidney injury. *QJM Int. J. Med.* **110,** 657–666 (2017).

11. Selby, N. M. *et al.* Design and Rationale of 'Tackling Acute Kidney Injury'', a Multicentre Quality Improvement Study'. *Nephron* **134,** 200–204 (2016).