Comparison of ICD-10 Diagnoses and Longitudinal Estimated Glomerular Filtration Rate in the Detection of Incident Stage 3 Chronic Kidney Disease: A Retrospective Comparison Study Using United Kingdom Secondary Care Data

PT37

Alycia Perkins[1], Federica Picariello[1], Joseph E O'Reilly[1], and Lewis Carpenter[1]

[1] Arcturis Data, Building One, Oxford Technology Park, Technology Drive, Kidlington, OX5 1GN UK
alycia.perkins@arcturisdata.co.uk

Introduction

- An estimated 5-7% of the United Kingdom (UK) population live with chronic kidney disease (CKD)[1].
  - At least half of cases are unlikely to be recorded in routine care[2].
  - Earlier stages of disease are less likely to be recorded[3].
- Previous work suggests **under recording of CKD may affect quality of care** and lead to quicker progression of CKD in untreated populations[2,4].
- Unrecorded CKD can potentially be identified retrospectively using **estimated glomerular filtration rate (eGFR)** recorded in longitudinal electronic healthcare records (EHR)

Objectives

1. Estimate the proportion of CKD patients identifiable only through eGFR.
2. Compare demographic characteristics between ICD-10 recorded and eGFR-only CKD patients.
3. Quantify the **delay in ICD-10 identification of stage 3 CKD** among those patients with both ICD-10 and eGFR confirmed CKD.

Methods

Study Design:
This retrospective longitudinal study used de-identified EHR between 2015 and 2021 from UK NHS partners collated as part of the Arcturis Real World Data Network, see Figure 1.

Population:
Longitudinal history for patients receiving secondary care who also have ICD-10 or OPCS-4 codes relating to CKD or renal dialysis. These patients may not necessarily have ICD-10 recorded stage 3 CKD and have irregular real-world eGFR measurements.

Code type	Codes included
ICD-10	N18*, N19*
OPCS-4	X40*, X41*, X42*, X43.1

Table 1: Codes included in data request for renal patients.

Secondary care patients were stratified by CKD status

ICD-10 Confirmed
Patients with an ICD-10 diagnosis of stage 3 CKD (N18.3).

eGFR-only
Patients with longitudinal eGFR measures indicative of stage 3 CKD, and no associated ICD-10 code indicative of CKD.

eGFR Calculation
When eGFR was missing, CKD-EPI equations[5] were applied to serum creatinine and cystatin-C measures.

CKD stage 3 calculation
At least two sustained eGFR measurements between 30-60 mL/min/1.73m^2 over at least 90 days[6].

Analysis:
Descriptive characteristics for these subgroups were collected at the earliest recorded stage 3 diagnosis. Time from eGFR identification to ICD-10 confirmation was summarised in years for the ICD-10 Confirmed group.

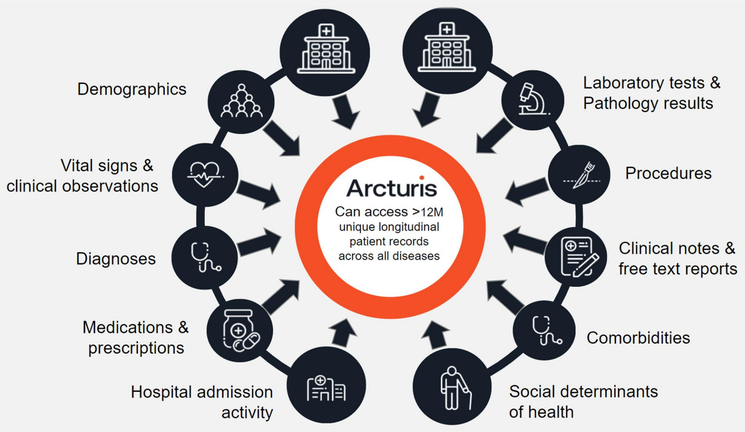

Figure 1: Data captured in the Arcturis Real World Data Network.

Results

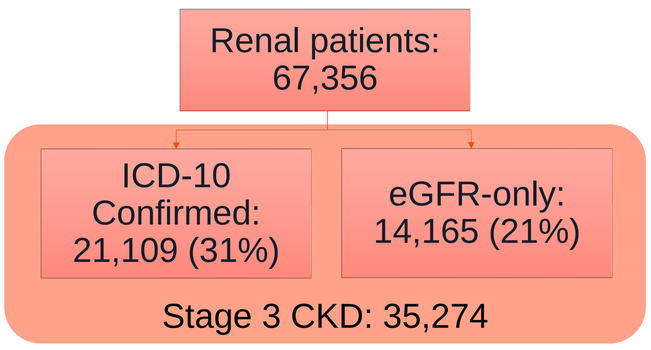

Figure 2: Flowchart describing cohort identification

- There was a median time lag from eGFR identification to ICD-10 confirmed CKD of 1.8 years.
- Of the 21,109 ICD-10 Confirmed patients, 15,573 (73%) had eGFR readings indicative of stage 3 CKD prior to diagnosis date.

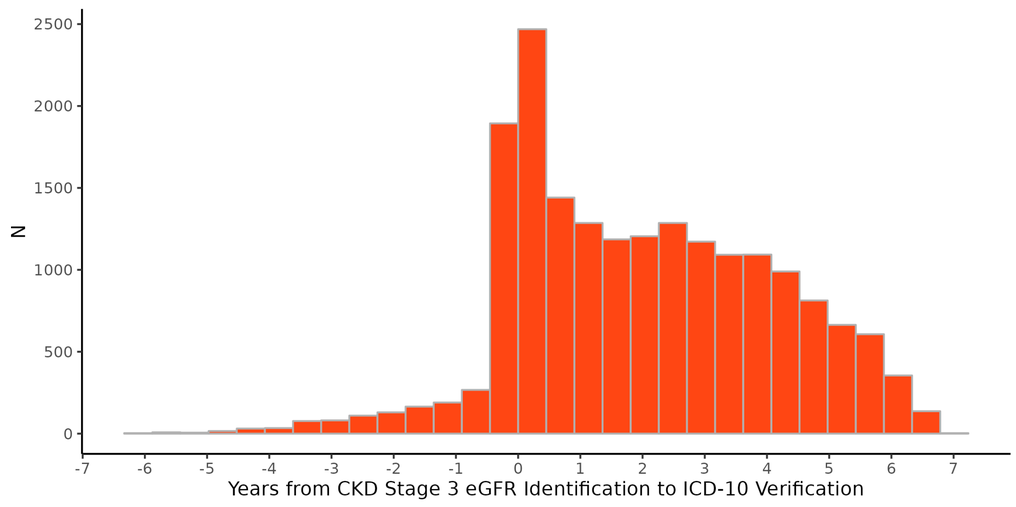

Figure 3: Time lag between identification of stage 3 CKD with eGFR and ICD-10.

Results

- Age, ethnicity, CCI, and IMD were comparable between the two cohorts.
  - While age, ethnicity, and CCI reflect the expected epidemiology of CKD patients, IMD is higher than expected due to the study population.
- There were proportionally more male patients in the eGFR-only group, 53%, compared to the ICD-10 confirmed group, 45%.
- A higher percentage of patients were missing IMD in the eGFR-only group at 63%, compared to 52% missing in the ICD-10 confirmed group.

Variable	Overall	ICD-10 confirmed	eGFR-only
Overall (N)	35274	21109	14165
Age range, mean (SD)	76.29 (13.56)	76.57 (13.37)	75.88 (13.84)
Sex (n, % male)	17049 (48.33)	9516 (45.08)	7533 (53.18)
Ethnicity, n (%)			
White	27806 (78.83)	16860 (79.87)	10946 (77.27)
Black	133 (0.38)	68 (0.32)	65 (0.46)
Asian	763 (2.16)	390 (1.85)	373 (2.63)
Not stated	6572 (18.63)	3791 (17.96)	2781 (19.63)
CCI, median (IQR)	1 (0, 2)	1 (0, 2)	1 (0, 3)
IMD, median (IQR)	8 (6, 9)	8 (6, 9)	8 (6, 9)
IMD missing, n (%)	19830 (56.22)	10950 (51.87)	8880 (62.69)

IMD: Index of Multiple Deprivation; CCI: Charlson Comorbidity Index.

Table 2: Baseline demographics of patients with ICD-10 confirmed vs eGFR-only stage 3 CKD.

Conclusions

- CKD is often poorly recorded in secondary care.
- Using **eGFR measures may identify incident CKD earlier than ICD-10** in high-risk patient groups seen for other conditions, as well as improving data coverage for research on this understudied group.
- Timely detection of stage 3 CKD is pivotal to slowing disease progression, improving patient outcomes, and reducing consequent healthcare resource utilisation.
- A limitation of the analysis is that only patients treated for renal conditions in secondary care are considered, potentially introducing selection bias in the study population.
- Future work is warranted to evaluate **differences in clinical outcomes** and healthcare resource utilisation for these patients.

Acknowledgements

The study data was obtained from the Arcturis Real World Data Network research database, which contains anonymised electronic health records. The Real World Data Network has received research database ethical approval from the NHS Health Research Authority Yorkshire & The Humber - Leeds East Research Ethics Committee (REC Reference: 24/YH/0164).

References

[1] S. A. Hull *et al.*, 'The National CKD Audit: a primary care condition that deserves more attention', *Br. J. Gen. Pract.*, vol. 68, no. 673, pp. 356–357, Aug. 2018, doi: 10.3399/bjgp18X697997.

[2] R. Sisk *et al.*, 'Diagnosis codes underestimate chronic kidney disease incidence compared with eGFR-based evidence: a retrospective observational study of patients with type 2 diabetes in UK primary care', *BJGP Open*, vol. 8, no. 1, Apr. 2024, doi: 10.3399/BJGPO.2023.0079.

[3] P. Jain *et al.*, 'The Need for Improved Identification and Accurate Classification of Stages 3–5 Chronic Kidney Disease in Primary Care: Retrospective Cohort Study', *PLoS ONE*, vol. 9, no. 8, p. e100831, Aug. 2014, doi: 10.1371/journal.pone.0100831.

[4] M. Molokhia *et al.*, 'Uncoded chronic kidney disease in primary care: a cross-sectional study of inequalities and cardiovascular disease risk management', *Br. J. Gen. Pract.*, vol. 70, no. 700, pp. e785–e792, Nov. 2020, doi: 10.3399/bjgp20X713105.

[5] Inker Lesley A. *et al.*, 'New Creatinine- and Cystatin C–Based Equations to Estimate GFR without Race', *N. Engl. J. Med.*, vol. 385, no. 19, pp. 1737–1749, Nov. 2021, doi: 10.1056/NEJMoa2102953.

[6] A. S. Levey *et al.*, 'Definition and classification of chronic kidney disease: A position statement from Kidney Disease: Improving Global Outcomes (KDIGO)', *Kidney Int.*, vol. 67, no. 6, pp. 2089–2100, Jun. 2005, doi: 10.1111/j.1523-1755.2005.00365.x.