QUALITY OF LIFE IN CHRONIC KIDNEY DISEASE: RESULTS FROM A SYSTEMATIC REVIEW OF CKD MODELS FOR TYPE 2 DIABETES

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Abstract

- Chronic kidney disease (CKD) is associated with reduced health-related quality of life (HRQoL). A cross-sectional study in patients with CKD showed that HRQoL decreased as CKD became more severe.[1] This was confirmed by a systematic literature review (SLR) of health state utilities (HSUs) for CKD stages 1–5 and renal replacement therapy (RRT), which reported decreasing HSUs with increasing CKD severity.[2] The exception to this pattern is HRQoL following renal transplant, which is generally associated with elevated HRQoL relative to dialysis.[2]

- Comparable results are available for patients with CKD and diabetes. A cross-sectional study of patients with diabetes in CKD stages 3–5 showed that all Kidney Disease Quality of Life-36 scores declined with more severe CKD stages, except for the mental composite summary.[3] A 12-year longitudinal study investigated HRQoL in adults who had CKD, diabetes, or both, and showed that physical (but not mental) HRQoL was reduced and declined more rapidly in patients with both conditions relative to those with one condition.[4]

- Novel pharmaceutical treatments such as sodium glucose co-transporter (SGLT2) inhibitors have been shown to have renoprotective and cardioprotective effects in patients with CKD, with and, for dapagliflozin, also without diabetes, and to slow CKD progression.[5] The consequently reduced burden of CKD and its associated sequelae may contribute to improvements of HRQoL outcomes.

- Health economic modelling could show such effects, using HSUs associated with treatment and sequelae to evaluate HRQoL over longer time periods. An SLR of HSUs suitable for the economic evaluation of interventions for CKD was recently published by Cooper *et al*.[2] The present SLR aimed to complement this study by identifying HSUs that had been used in published models of CKD in type 2 diabetes mellitus (T2DM).

Methods

Systematic literature review

Searches for published models were conducted in PubMed (including MEDLINE), Embase, and the Cochrane Library. Search strings combined free text and controlled vocabulary, with strings modified from a previous SLR[6], in addition to hand searches of reference lists from included studies. In all three databases, searches were implemented on March 6, 2021, with no date limit except for conference abstracts in Embase (only from 2019 onwards). Search results were retrieved using Sourcerer (Covalence Research Ltd., London, UK).

Eligibility criteria and screening

Studies were eligible for inclusion if they reported on computer simulation models of kidney disease progression and its outcomes in populations with T2DM. Use cases of otherwise identified models were excluded as were model descriptions with insufficient detail, e.g., models described only in conference abstracts. A single researcher screened titles, abstracts, and full texts.

Data extraction

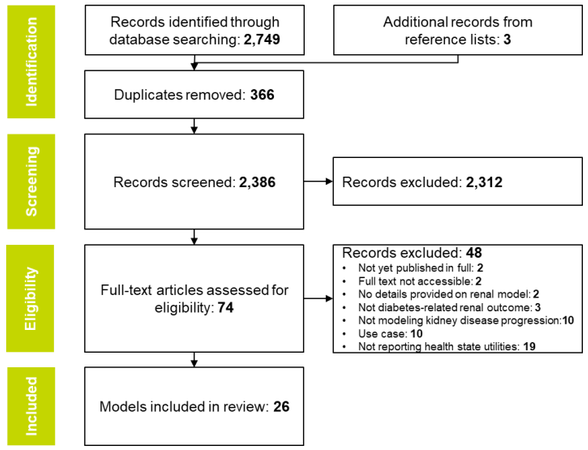
For each eligible model, metadata were extracted as were reported HSUs for each health state or disease outcome. In addition, for each reported HSU, the original source of the HSU value, if different from the modelling study, was identified and information on the instrument used to elicit HSUs extracted. A single researcher performed data extraction.

Analyses

For each model, the "baseline" HSU was identified, i.e., the HSU for the least severe CKD state in the model, usually a kidney disease-free state such as "normoalbuminuria" or "normal kidney function". HSUs for non-baseline states were grouped as micro- or macroalbuminuria or as end-stage kidney disease (ESKD), with a distinction by RRT type, and expressed as mean (standard deviation [SD]) utility decrements relative to the model baseline state.

Statistical analyses and plotting were conducted in R.

Figure 1 Flow diagram for study selection



Results

Study selection

The SLR returned 2,752 records, of which 2,386 were unique records whose titles and abstracts were screened. Full texts were assessed for seventy-four articles, of which twenty-six reported HSUs and were included in the review (Figure 1).

Instruments to obtain HSUs

The most widely used instruments were the EQ-5D (3L: n=31 [30% of HSU values]; 5L: n=3 [3%]), followed by time trade-off methods (n=26 [25%]). In contrast, 30 HSUs (29%) were assumption-based or the instrument underlying their elicitation could not be identified. Notably, nine computer simulation models combined HSUs derived from different instruments.

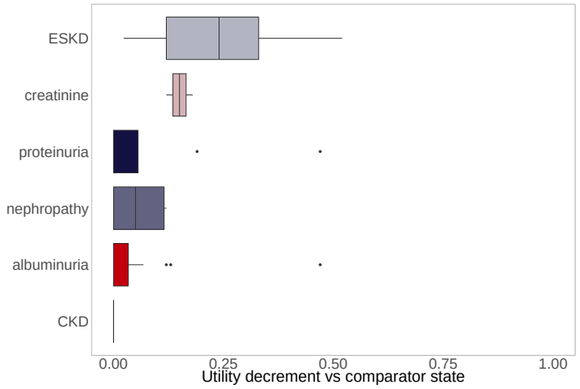
Baseline health state utilities

Baseline states were assumed to be perfect (HSU=1) or near-perfect (HSU=0.95) health in seven models. The remainder used published HSUs to inform their baseline states. Across all models, the mean utility of baseline states was 0.85 (SD: 0.11).

CKD-related HSUs

Increasing kidney disease severity was associated with increasing utility decrements (Figure 2).

Figure 2: Utility decrements relative to baseline states



For a figure with more fine-grained aggregation, see the handout.

Micro- (mean disutility 0.032 [SD: 0.11]) and macro-albuminuria (mean disutility 0.033 [SD: 0.04]) were associated with small disutilities. Doubling of serum creatinine was modelled with a mean disutility of 0.15 (SD: 0.04). In contrast, ESKD was associated with a mean disutility of 0.25 (SD: 0.13), with larger decrements for dialysis relative to kidney transplant.

Conclusions

- HSUs used in models reflected increasing disutility as CKD become more severe. Albuminuria states were associated with small HRQoL losses, but losses were more substantial for ESKD. Few HSUs were identified for CKD stages.

- As improving HRQoL in patients with CKD has proven difficult,[7] it may be worthwhile to model HRQOL effects of novel treatments through reductions in the incidence of cardiovascular and kidney events and delay in disease progression in patients with CKD and T2DM.

References

1. Aggarwal HK, *et al.*, QJM 109, 711-6, 2016.
2. Cooper JT, *et al.*, Health Qual Life Outcomes 18, 310, 2020.
3. Zimbudzi E, *et al.*, PLoS One, 11, e0168491, 2016.
4. Wyld MLR, *et al.*, Nephrol Dial Transplant 36, 1048-56, 2021.
5. Heerspink HJL, *et al.*, NEJM 383, 1436-46, 2020.
6. Sugrue DM, *et al.*, PharmacoEconomics 37, 1451-68, 2019.
7. Greenwood SA, *et al.*, Health Technol Assess 25, 1-52, 2021.

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