A health policy model of CKD. Part 2: The cost-effectiveness of microalbuminuria screening

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study examined the cost-effectiveness of microalbuminuria screening, compared with usual care or no screening, for the detection of early stage chronic kidney disease. Screening was cost-effective in patients with diabetes or hypertension, and in patients with neither diabetes nor hypertension if there was a long screening interval or during existing physician visits. There was limited reporting of the clinical and utility data selection methods and their validity. If these data are valid, the authors’ conclusions appear to be appropriate.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
This study examined the cost-effectiveness of microalbuminuria screening, compared with usual care or no screening, for the detection of early stage chronic kidney disease (CKD).

Interventions
Universal microalbuminuria screening was assessed for all individuals, and in subpopulations with diabetes, with hypertension without diabetes, and with neither diabetes nor hypertension. Screening intervals of one, two, five, and 10 years were evaluated, with a starting age of 50 years, as well as screening once at 50 years old. A positive diagnosis was followed by treatment with angiotensin-converting enzyme (ACE) inhibitors or angiotensin II receptor blockers (ARBs). The usual care was defined as part of the population undergoing some screening and treatment. No screening was also considered.

Location/setting
USA/primary and secondary care.

Methods
Analytical approach:
The analysis used a micro-simulation model of the natural history of CKD to estimate the cost-effectiveness of microalbuminuria screening, in a cohort of individuals aged 50 years, until the age of 90 years or death (if earlier). The model was published in an accompanying article in the same journal issue as the paper reviewed here (Hoerger, et al. 2010, see 'Other Publications of Related Interest' below for bibliographic details) . The authors stated that the health care system perspective was used. The health states included death, no CKD, and CKD stages one to five, which were defined by the glomerular filtration rate (GFR) and kidney damage or albuminuria.

Effectiveness data:
The screening and treatment estimates, such as the usual care screening rates and test sensitivity, were mostly from US published sources. These included a systematic review, three randomised controlled trials (RCTs), a US cost-effectiveness study (for the types of diagnostic tests and the probabilities of each test being recommended), and a technical expert panel.

Monetary benefit and utility valuations:
The utility estimates were from a range of published studies. The utilities for the GFRs were from a study that used a time trade-off approach. The utility for a normal health state was assumed to be one, and utility decrements, calculated as the difference from the utility for the highest GFR, were applied.
Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
Three types of annual costs were included: the medical costs for early stages of CKD; stage five CKD and end-stage renal disease; screening and ACE and ARB treatment. Treatment-related complication costs were included. The unit costs came from a published algorithm, the US Renal Data System's 2006 Annual Data Report, the Centers for Medicare and Medicaid Services, the national Healthcare Cost and Utilization Project, and average wholesale prices listed in the Drugs Topics Redbook. All costs were in US dollars ($), inflated to the price year 2006, using the medical component of the consumer price index. They were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way sensitivity analysis was conducted to test the impact on the cost-effectiveness results (for the full population) of varying the key parameters by ±25%, including the efficacy and adherence, screening test sensitivity, costs, and progression. Alternative assumptions for the discount rate, screening start age, and measures to estimate the GFR were investigated. The results were presented in tables and graphs.

Results
Universal annual screening, starting at 50 years old, had an incremental cost-effectiveness ratio (ICER) of $73,000 per QALY gained relative to no screening and $145,000 per QALY relative to usual care. The ICERs improved (decreased) with less frequent screening.

Subpopulation-targeted annual screening had ICERs, relative to no screening of $21,000 per QALY for patients with diabetes, $55,000 per QALY for patients with hypertension, and $155,000 per QALY for individuals with neither diabetes nor hypertension.

All scenarios were cost-effective for diabetes patients, at a threshold of $50,000 per QALY, relative to no screening and usual care. All scenarios (except annual screening) were cost-effective for hypertension patients, and no scenario was cost-effective, compared with usual care, for patients with neither diabetes nor hypertension.

The ICERs for universal annual screening at all the different starting ages were over $60,000 per QALY for the full population, below $50,000 per QALY for diabetes patients, and over $50,000 per QALY for patients with hypertension without diabetes.

One-way sensitivity analysis showed the results were most sensitive to the microalbuminuria incidence, treatment adherence, and the discount rate. The cost-effectiveness of screening as a function of the screening cost showed that if screening could be provided during a scheduled office visit, it generated an ICER of $20,000 per QALY for the full population, and $41,000 per QALY for those with neither diabetes nor hypertension.

Authors' conclusions
The authors concluded that microalbuminuria screening was cost-effective for patients with diabetes or hypertension, but was not cost-effective for individuals with neither diabetes nor hypertension, unless it was conducted at long intervals or during existing regular physician visits.

CRD commentary
Interventions:
The rationale for the selection of the comparators was clear as the screening strategies were compared with the usual care in the authors' setting.

Effectiveness/benefits:
The estimates for the clinical inputs were clearly reported and their sources were provided, with more details in an appendix. The authors did not report a systematic review to identify the best available evidence. The utility values were from published literature, but it was unclear if all studies used the same method (time trade-off). QALYs were an
appropriate benefit measure, given the impact of kidney disease on quality of life and survival.

Costs:
The costs were consistent with the authors' stated perspective. The cost categories were reported and the costs were from US sources. There was resource use was not reported, which restricts the ability to reproduce the analysis for other settings. Price year adjustments and discounting were reported.

Analysis and results:
The analytic approach and assumptions were generally well described and the authors referred readers to another publication for the model and an online technical appendix. The costs and benefits were appropriately synthesised, using an incremental approach, and ICERs were calculated relative to usual care, as well as no screening. The findings were clearly presented and illustrated. The uncertainty was partly explored in univariate sensitivity analysis for the full population, but not for the population subgroups. A probabilistic sensitivity analysis could have more fully captured the parameter uncertainty, enhancing the reliability of the results. The authors compared their results with those of a previous analysis of macroalbuminuria screening, which were similar. They briefly mentioned the limitations of their analysis, including those inherent to micro-simulation modelling.

Concluding remarks:
There was limited reporting of the clinical and utility data selection methods and their validity. If these data are valid, the authors’ conclusions appear to be appropriate.

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