Cost-effectiveness of screening for microalbuminuria among African Americans


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
The objective was to assess the cost-effectiveness of screening for microalbuminuria in African Americans and non-African Americans aged at least 50 years. The authors concluded that screening all African Americans for microalbuminuria at either five- or 10-year intervals was cost-effective and screening non-African Americans with diabetes or hypertension was cost-effective. There were some limitations in reporting and data availability but the authors' conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of screening for microalbuminuria in African Americans and non-African Americans aged at least 50 years.

Interventions
One intervention was assessed: screening for microalbuminuria followed by treatment with angiotensin-converting enzyme inhibitors or angiotensin II-receptor blockers. Four different screening strategies were considered: screening at 10-, five-, two- and one-year intervals. The comparator was usual care. The usual care scenario was based on actual annual microalbuminuria screening probabilities of 23% for patients with diabetes and hypertension, 22% for patients with diabetes only, 2% for patients with hypertension only and 0% (no probability of screening) for patients with neither diabetes nor hypertension.

Location/setting
USA/in-patient/outpatient

Methods
Analytical approach:
A micro-simulation model that was previously developed to simulate the natural history of chronic kidney disease progression among a cohort of persons aged 30 over a 60-year time horizon was adapted and utilised. The model included seven states: no chronic kidney disease, disease stages 1-5 (defined by glomerular filtration rate and the presence of kidney damage/albuminuria) and death. Simulations were undertaken for African Americans and non-African Americans using appropriate risk factors for each group (diabetes diagnosed at age 50, hypertension systolic blood pressure at least 145 and neither diabetes nor hypertension at age 50). The authors did not state the perspective of their analysis but it appeared to be that of a third-party payer.

Effectiveness data:
Effectiveness data were derived from various sources including epidemiological literature, clinical trials and a previous cost-effectiveness study. Standard care screening probabilities were based on US Renal Data System (USRDS) 2006 Annual Data Report. Sensitivity and specificity of screening were derived from the literature. Assumptions were made regarding non-adherence of treatment after diagnosis and the effect of therapy.

For the state transition probabilities, the model (chronic kidney disease Health Policy Model, which predicted the risk of end-stage renal disease in the overall USA population) was calibrated so as to produce results in line with observed data from the National Health and Nutrition Examination Survey (NHANES) and USRDS. This included a 20%
increase in the rate of glomerular filtration rate decline at stage 3 and a 60% increase in the rate of decline at stage 4 for the African American population. Progression rates for non-African Americans were decreased slightly to keep lifetime end-stage renal disease incidence constant for the general population.

Monetary benefit and utility valuations:
Utility values were derived for each of the glomerular filtration rate states. Utility values were derived from a time-trade-off analysis conducted by Gorodetskaya (see Other Publications of Related Interest). The utility values did not vary by ethnic group. The authors included a utility decrement of 0.01 for macroalbuminuria.

Measure of benefit:
The measure of benefit was the quality-adjusted life-year (QALY). Future benefits were discounted at an annual rate of 3%.

Cost data:
Costs included screening costs and all medical costs (both attributable and not directly attributable to chronic kidney disease). Early disease stage costs were derived from cost function estimates for a privately insured population. For the one-year period in disease stage 5 costs were estimated as a combination of six months of stage 4 costs and the costs for the six months just before end-stage renal disease initiation using costs from USRDS. Estimates form the USRDS 2006 Annual Data Report were used to calculate first and subsequent year end-stage renal disease costs. Screening costs were based on Centers for Medicare and Medicaid Services physician and laboratory reimbursement rates. All costs were reported in 2006 US dollars ($). Future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
One way sensitivity analysis was conducted to assess the impact of individual parameter uncertainty on the cost-effectiveness estimates. Key parameter values were increased and decreased by 25%. The discount rate was varied between zero and 5%. The results of the sensitivity analysis were reported in tornado diagrams.

Results
Costs were rounded to the nearest $100. ICERs (incremental cost-effectiveness ratios) were rounded to the nearest $1,000 per QALY. Results were reported fully (only those for the African American population are presented here).

For African Americans, usual care total costs were $148,200 and total QALYs were 16.537. Screening at 10-year intervals resulted in $148,400 and 16.567 QALYs, five-year intervals $148,500 and 16.571 QALYs, two-year intervals $148,900 and 16.574 QALYs and one-year intervals $149,400 and 16.575 QALYs.

Compared with usual care 10-year screening had an ICER of $9,000, five-year screening $11,000, two-year screening $19,000 and one-year screening $33,000.

A full incremental analysis estimated that 10-year screening compared with usual care had an ICER of $9,000 per QALY, five-year screening compared with 10-year screening had an ICER of $24,000 per QALY, two-year screening compared with five-year screening had an ICER of $113,000 per QALY and one-year compared with two-year had an ICER of $635,000.

For all risk factor groups the ICER for one-year screening compared with usual care for African Americans remained at $35,000 or under per QALY.

In the sensitivity analysis, all ICER values for one-year interval screening compared with usual care for African Americans remained under $50,000 per QALY. Results were most sensitive to the microalbuminuria incidence estimate, treatment adherence rates and the discount rate.

Authors' conclusions
The authors concluded that screening all African Americans for microalbuminuria at either five- or 10-year intervals was cost-effective and screening non-African Americans with diabetes or hypertension was cost-effective.

CRD commentary
Interventions:
The interventions appeared appropriate and included usual care. The authors did not discuss any alternative relevant comparators.

Effectiveness/benefits:
Most of the effectiveness estimates were clearly reported. The sources used to estimate effectiveness values were clearly reported but the methods used to derive these sources was not reported. There was insufficient information to assess data validity. The method of utility valuation and the source were reported but the utility values were not reported. Many of the limitations in reporting were likely to be due to use of a published natural history model which was tweaked to incorporate population group-specific risk factor prevalence and progression parameters based on the National Health and Nutrition Examination Survey. Full details surrounding the development and data used in the original model were reported elsewhere. It was not clear whether data such as screening, sensitivity and specificity and treatment adherence were estimated based on the best available evidence or selected due to their use in the original model. Further discussion around the identification and selection of data to inform these parameters would have been useful.

Costs:
Costs were appropriate for a third-party payer perspective. The sources used to derive costs were reported clearly and were specific to USA. There was no breakdown of individual screening and medical costs used in the model. Screening costs were based on Medicare reimbursement rates. The lack of detail on unit costs and resource combined with the use of reimbursement rates limited the generalisability outside of the authors setting.

Analysis and results:
The model was clearly described but there was no model diagram. To fully critique the model other publications would need to be assessed. However, the analyses and results presented were appropriate. Sensitivity analysis was limited. The choice to alter values between 25% increments was not likely to have accurately reflected parameter uncertainty. Univariate sensitive analysis only estimates the effect of single parameter uncertainty on the results; probabilistic sensitivity analysis would have more accurately estimated the effect of uncertainty by altering parameter values simultaneously.

The authors highlighted several limitations to their analysis, all caused by data limitations. The authors stated that limited data existed in several areas and these included: estimating the relationship between chronic kidney disease and the risk factors and complications included in the model, especially for African Americans; controlling for differences in access to care between African Americans and other ethnic groups; and evidence on the efficacy of therapy for patients without diabetes or hypertension. The authors highlighted that there was no clear reason as to why African Americans should progress more rapidly than others in chronic kidney disease stages 3 and higher. They stated that explaining this relationship would add validity to their model.

Concluding remarks:
There were some limitations in reporting and data availability but the authors’ conclusions appear to be appropriate.

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