THE UNIVERSITY OF QUEENSLAND AUSTRALIA

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ACE–PREVENTION PAMPHLETS

INDIGENOUS POPULATION RESULTS PAMPHLET 3
COST-EFFECTIVENESS OF INTERVENTIONS FOR KIDNEY DISEASE: RENAL REPLACEMENT THERAPY ANDSCREENING AND EARLY TREATMENT OF CHRONIC KIDNEY DISEASE

1. MAIN MESSAGES

- Maintenance renal dialysis therapy is very expensive and an inefficient use of health resources based on cost-effectiveness.
- However the widespread adoption of renal dialysis indicates that the 'rule of rescue' has been adopted – 'an ethical imperative to save individual lives even when money might be more efficiently spent to prevent deaths in the larger population' (Doughety, 1993.
- On the other hand, screening for Chronic Kidney Disease followed by treatment with ACE-inhibitor drugs is very cost-effective in Indigenous people with diabetes of all ages irrespective of remoteness.
- Screening for Chronic Kidney Disease followed by treatment with ACE-inhibitor drugs is also cost-effective in Indigenous people who do not have diabetes from age 40 onwards and still has a high probability of being cost-effective if screening were to start at age 25.
- Given the very high cost of dialysis and transplant in people with end-stage kidney failure it is strongly recommended that screening for Chronic Kidney Disease is implemented with priority for the Indigenous population.

2. BACKGROUND

The Indigenous population of Australia has very high rates of chronic kidney disease and renal failure, particularly those living in remote areas. Indigenous people are six times as likely as non-Indigenous people to receive dialysis or transplant. Chronic kidney disease accounted for 4% of all deaths among the Indigenous population in 2007. Renal replacement therapy (RRT) to treat end-stage kidney disease is expensive. It is estimated that expenditure on chronic kidney disease in 2000-01 in the whole population was AUD 647 million, consuming 1.3% of the total recurrent health expenditure. However, there has been a general lack of information on chronic kidney disease in Australia and particularly so in Indigenous Australians due to the limited national monitoring system and the only recent development of a clear definition of the disease.

NHMRC GRANT NO. 351558
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the Lowitja INSTITUTE
Australia's National Institute for Aboriginal and Torres Strait Islander Health Research

"The Aboriginal and Torres Strait Islander component of ACE-Prevention was supported by the Cooperative Research Centre for Aboriginal Health (CRCAH). In January 2010, the CRCAH was refunded by the CRC Program and renamed the Cooperative Research Centre for Aboriginal and Torres Strait Islander Health (CRCATSIH), and incorporated into The Lowitja Institute – Australia's National Institute for Aboriginal and Torres Strait Islander Health Research.

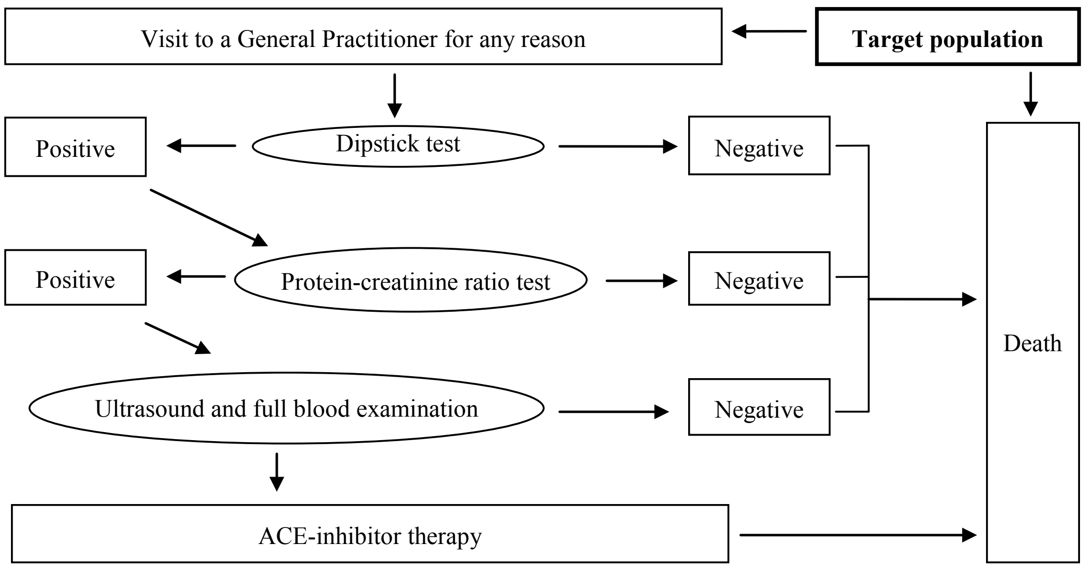
3. INTERVENTIONS

Chronic kidney disease is often without symptoms until it has reached an advanced stage. Once a person becomes aware of symptoms, the disease has often progressed close to its end-stage and renal replacement therapy, either renal dialysis or kidney transplant, becomes inevitable. In this study, we compare the Incremental cost-effectiveness ratio (ICER) for the following treatment scenarios:

a) Current program (of moving patients from dialysis to transplantation when organs become available) compared to no treatment;
b) Renal dialysis only compared to no treatment; and
c) Current program compared to renal dialysis only.

Alternatively, preventive strategies are available to manage chronic kidney disease before symptoms develop. There are several markers available for testing which allow detection of renal damage at earlier stages. Effective therapies to slow progression of chronic kidney disease to end-stage disease are available. In this study, we investigated the cost-effectiveness of a screening program for proteinuria among people aged 25-79 when they visit a general practitioner for another reason. We separately consider people with and without diabetes mellitus. The initial screening is by a urine dipstick to detect protein in the urine. Those testing positive are subsequently given a confirmatory test (protein-creatinine ratio) and an ultrasound of the kidneys and a full blood examination. Subsequent life-long therapy with angiotensin-converting enzyme (ACE) inhibitor is then provided to people identified with chronic kidney disease (Figure 1). We also take into account that ACE-inhibitors have a protective effect on ischemic heart disease and stroke.

Figure 1: Event pathway of screening and early treatment



We compare the intervention with a scenario without the intervention, since there is currently no policy of screening for proteinuria in Australia.

4. INTERVENTION COST-EFFECTIVENESS

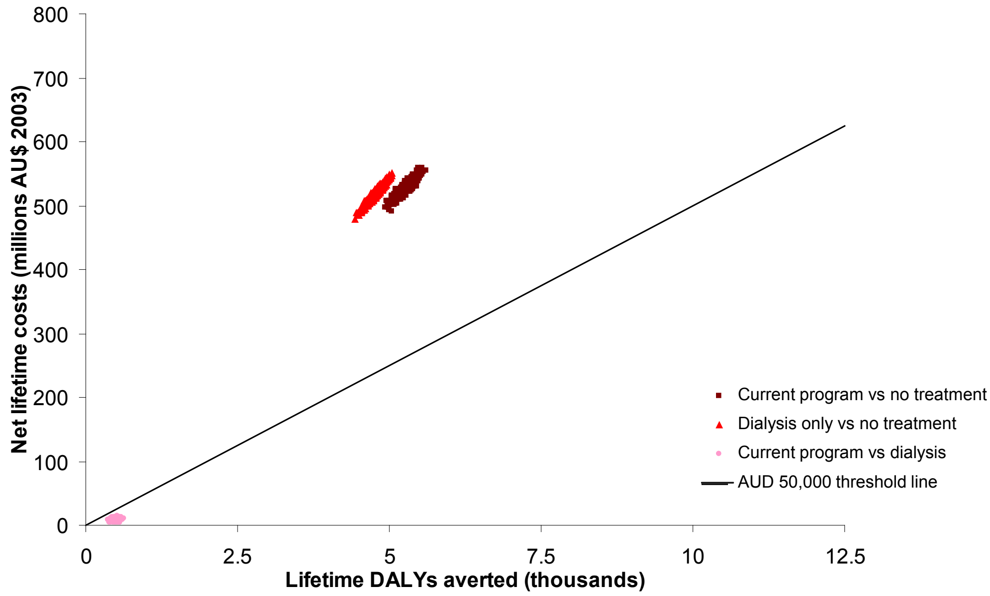
RENAL REPLACEMENT THERAPY

All three benchmarks fall in the north-east ('health gain at a cost') quadrant of the cost-effectiveness plane (Figure 2). Specifically, when comparing the current program to dialysis only, the ICERs for both of the populations fall under $50,000 deeming the intervention to be a cost-effective one.

Table 1 Cost-effectiveness ratios and probability of being cost-effective (renal replacement therapy)

Benchmark	Cost per DALY (95% uncertainty range)	Probability of being < AUD50,000/DALY
Current program compared to no treatment	101,000 (100,000 – 103,000)	0%
Dialysis only compared to no treatment	110,000 (109,000 – 112,000)	0%
Current program compared to dialysis only	17,000 (10,000 – 24,000)	100%

Figure 2: Cost-effectiveness of the intervention for different benchmark illustrated on a cost-effectiveness plane with AU$ 50,000 per DALY threshold line (renal replacement therapy)



SCREENING AND EARLY TREATMENT

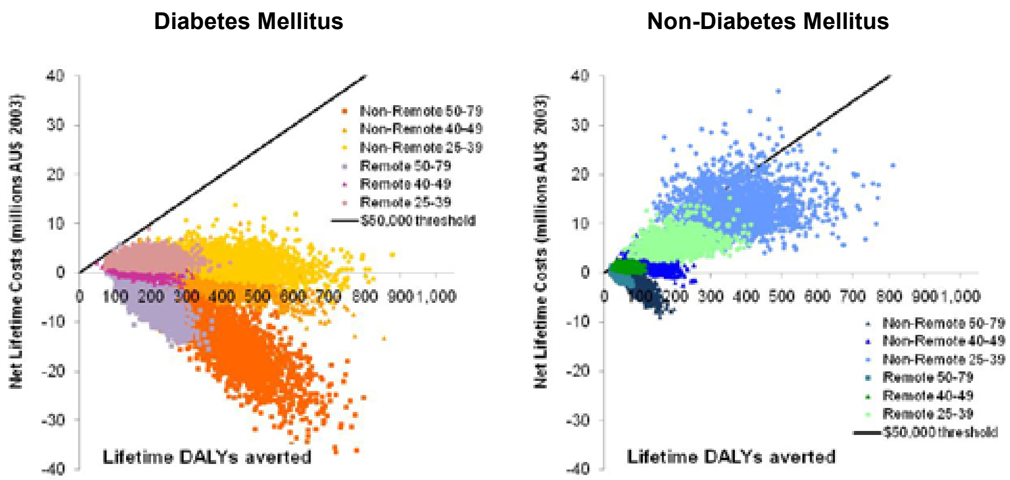
Table 2 provides the ICER and the probabilities of being cost-effective. The intervention targeting different age-groups fall in the north-east ('health gain at a cost') and south-east ('health gain and net cost saving') quadrants of the cost-effectiveness plane (Figure 3). Targeting people with DM, those in remote areas, and the higher age-groups in non-remote areas have 100% probability of being cost-effective. Net cost-savings would be achieved by focusing on people with DM and those aged 50 and over.

Table 2: Cost-effectiveness ratios and probability of being cost-effective (screening and early treatment of chronic kidney disease)

Target population (age range)	Cost per DALY (95% uncertainty range)	Probability of being < AUD50,000/DALY
Diabetes mellitus		
Non-remote 50-79	Dominant* (Dominant – Dominant)	100%
Non-remote 40-49	Dominant (Dominant – 11,000)	100%
Non-remote 25-39	4,000 (Dominant – 20,000)	100%
Remote 50-79	Dominant (Dominant –0)	100%
Remote 40-49	5,000 (Dominant – 20,000)	100%
Remote 25-39	12,000 (4,000 – 29,000)	100%
Non-diabetes mellitus		
Non-remote 50-79	Dominant (Dominant – 15,000)	100%
Non-remote 40-49	17,000 (0 – 49,000)	98%
Non-remote 25-39	36,000 (17,000 – 75,000)	82%
Remote 50-79	Dominant (Dominant – 20,000)	100%
Remote 40-49	17,000 (5,000 – 41,000)	99%
Remote 25-39	30,000 (15,000 – 60,000)	94%

* Dominant means the cost-effectiveness ratio falls in the south-east quadrant, where more benefits can be accrued at a lower cost (i.e. health gain with cost saving).

Figure 3: Cost-effectiveness of the intervention for different target populations illustrated on a cost-effectiveness plane with AU$ 50,000 per DALY threshold line (screening and early treatment of chronic kidney disease)



5. CONCLUSIONS

Maintenance dialysis is so expensive that few individuals can afford treatment out of pocket. Thus, the provision of renal replacement therapy by the government as a third-party funder has the potential to reduce inequalities. Provision of renal replacement therapy for the Indigenous population is already current practice. However, the high cost associated with delivering dialysis therapy may hinder such an intervention from being sustainable. Costs associated with delivering culturally secure services in remote areas of Australia are likely to be even higher. Economists invoke the 'rule of rescue' if there is a high-cost but life-saving intervention to a small number of individuals even if it would not otherwise be recommended based on cost-effectiveness. The rule of rescue may be considered relevant to renal dialysis for patients with end-stage kidney disease given the low number of donor organs facilitating transplantation, the lethal prognosis, and the demonstrated effectiveness of dialysis therapy. However, whether the numbers of patients are few enough to evoke the rule of rescue may be debatable. The widespread adoption of renal dialysis in Australia, like in other industrialised countries, indicates the rule of rescue has been adopted implicitly even if this may not have been made explicit as we do with our analysis.

On the other hand, the intervention to screen for proteinuria and subsequent prescription of ACE-inhibitor therapy is cost-effective for the Indigenous population in Australia. Targeting people with DM would yield more health benefits with a net cost saving regardless of age and remoteness. Provision of the intervention to people without DM would also be recommended and would be cost-effective even if young adults from age 25 onwards are included. We have modelled this as a once-off screening intervention. That is sufficient to establish the cost-effectiveness credentials. The next step would be to undertake more complicated (microsimulation) modelling to establish how often screening should be done. Second-stage filter criteria generally favour the intervention in terms of equity, stakeholders' acceptability, and feasibility grounds. However, the strength of evidence is somewhat affected because the prevalence of proteinuria, which has a bearing on the efficiency of the screening program, is not well known among the Indigenous population.

6. REFERENCE

(Doughety, 1993, pp1359) quoted in: John McKie & Jeff Richardson (2003) "The Rule of Rescue" Social Science & Medicine Volume 56, Issue 12, June 2003, Pages 2407-2419.

A full briefing paper is available at **www.sph.uq.edu.au/bodce-ace-prevention**

7. ABOUT ACE-PREVENTION

To aid priority setting in prevention, the Assessing Cost-Effectiveness in Prevention Project (ACE-Prevention) applies standardised evaluation methods to assess the cost-effectiveness of 100 to 150 preventive interventions, taking a health sector perspective. This information is intended to help decision makers move resources from less efficient current practices to more efficient preventive action resulting in greater health gain for the same outlay.

ACE–PREVENTION PAMPHLETS

PAMPHLETS IN THIS SERIES

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A. The ACE-Prevention project
B. ACE approach to priority setting
C. Key assumptions underlying the economic analysis
D. Interpretation of ACE-Prevention cost-effectiveness results
E. Indigenous Health Service Delivery

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2. Alcohol
3. Blood pressure and cholesterol lowering
4. Cannabis
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6. Childhood mental disorders
7. Fruit and vegetables
8. HIV
9. Obesity
10. Osteoporosis
11. Physical activity
12. Pre diabetes screening
13. Psychosis
14. Renal replacement therapy, screening and early treatment of chronic kidney disease
15. Salt
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Overall results
1. League table
2. Combined effects

Indigenous population results
1. Cardiovascular disease prevention
2. Diabetes prevention
3. Screening and early treatment of chronic kidney disease

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