# ACE–PREVENTION PAMPHLETS

## GENERAL POPULATION RESULTS PAMPHLET 14
## COST-EFFECTIVENESS OF INTERVENTIONS FOR KIDNEY DISEASE: RENAL REPLACEMENT THERAPY AND SCREENING 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 people with diabetes of all ages.
- Screening for Chronic Kidney Disease followed by treatment with ACE-inhibitor drugs is also cost-effective in people who do not have diabetes from age 50 onwards.
- Given the very high cost of renal replacement therapy in people with end-stage kidney failure, it is strongly recommended that screening for Chronic Kidney Disease be implemented for all Australians over the age of 50 and all diabetics regardless of age.

### 2. BACKGROUND

Kidney disease has significant impacts on quality of lives of affected people, health resource use, health spending and mortality. In Australia, kidney disease accounted for 2.6% of the total disability-adjusted life years (DALYs) faced by the population in 2003. It is estimated that the prevalence of some stage of chronic kidney disease among Australians aged 25 and over is about 14%. Renal replacement therapy to treat end-stage kidney disease is expensive. It is estimated that expenditure on chronic kidney disease in 2000-01 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 due to the limited national monitoring system and the only recent development of a clear definition of the disease.

### 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.

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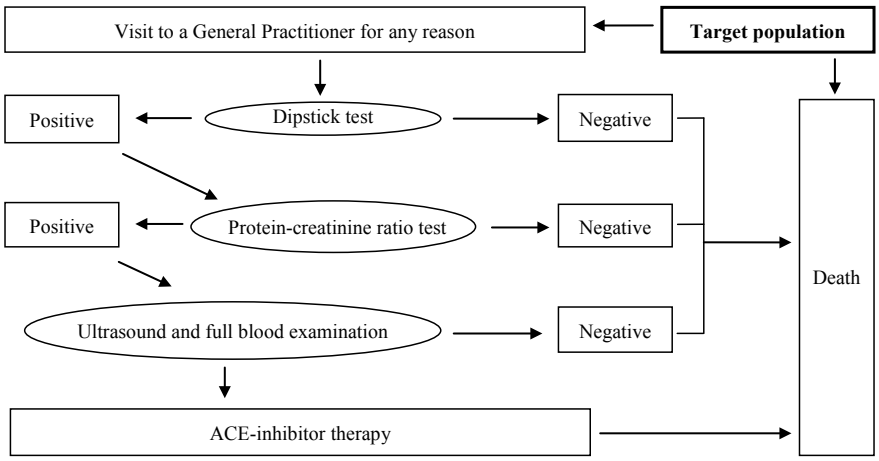
Figure 1: Event pathway of screening and early treatment




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

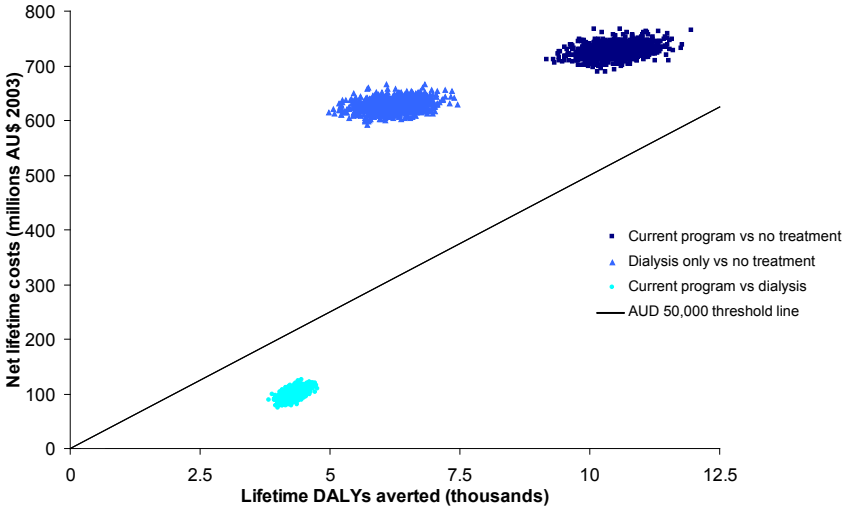
### RENAL REPLACEMENT THERAPY

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 | 70,000 (65,000 – 76,000) | 0% |
| Dialysis only compared to no treatment | 103,000 (91,000 – 118,000) | 0% |
| Current program compared to dialysis only | 23,000 (20,000 – 26,000) | 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

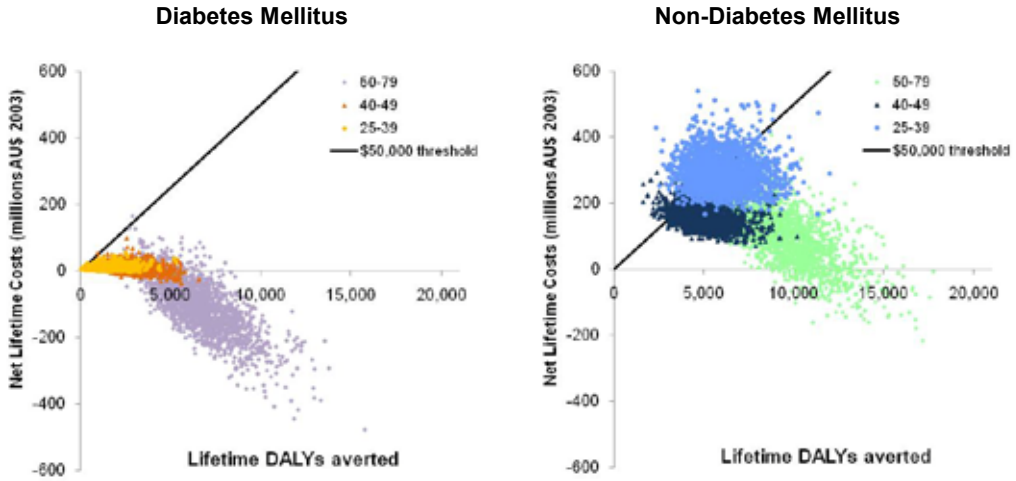
Table 2 provides the ICER and the probabilities of being cost-effective. The intervention targeting different age-groups fall in the north-east ('health gain at a cost') or south-east ('health gain and net cost saving') quadrants of the cost-effectiveness plane (Figure 3). Targeting people with diabetes mellitus and those aged 50 years and over have 100% probability of being cost-effective. Net cost-savings would be achieved by focusing on people with diabetes mellitus aged 50 and over. Targeting people without diabetes mellitus over the age of 50 is cost-effective, but the probability of a cost-effective resultdecreases to 89% and 52% for people in the age groups of 40-49 and 25-39, respectively.

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** | | |
| 50-79 | Dominant* (Dominant – 8,000) | 100% |
| 40-49 | 4,000 (Dominant – 18,000) | 100% |
| 25-39 | 8,000 (1,000 – 25,000) | 100% |
| **Non-diabetes mellitus** | | |
| 50-79 | 12,000 (Dominant – 38,000) | 100% |
| 40-49 | 33,000 (15,000 – 63,000) | 89% |
| 25-39 | 49,000 (27,000 – 89,000) | 52% |

* 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 on a national scale is already current practice. However, the high cost associated with delivering dialysis therapy may hinder such an intervention from being sustainable.

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.

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On the other hand, the intervention to screen for proteinuria and subsequent prescription of ACE-inhibitor therapy is cost-effective for the Australian population. Targeting people with diabetes mellitus would be cost-effective regardless of age, and would yield more health benefits with a net cost-savings for those aged 50 years and over. Provision of the intervention to people without diabetes mellitus would also be recommended if targeted at people aged 50 and over. However, inclusion of younger people, particularly those below the age of 40, has a less favourable cost-effectiveness.

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 modelling (using micro-simulation methods) to establish how often screening should be done.

## 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.

## PAMPHLETS IN THIS SERIES

**Methods:**

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

**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

**General population results**

1. Adult depression
2. Alcohol
3. Blood pressure and cholesterol lowering
4. Cannabis
5. Cervical cancer screening, Sunsmart and PSA screening
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
16. Suicide prevention
17. Tobacco

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