Screening for prostate, breast and colorectal cancer in renal transplant recipients
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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.

Health technology
The paper examines the cost-effectiveness of specific screening for prostate, breast and colorectal cancer for patients who have received a renal transplant. Breast cancer screening comprised a mammogram every 18 months. Prostate cancer screening involved an annual digital rectal examination and a prostate specific antigen assay. The screening programme for colorectal cancer required a faecal occult blood test every year and sigmoidoscopy every 5 years.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The hypothetical population under examination were renal transplant recipients aged 50 years.

Setting
The setting was secondary care. The economic study was carried out in Canada.

Dates to which data relate
The effectiveness and cost evidence was taken from studies published between 1982 and 2002. It was reported that the majority of the costs had been adjusted to 1995 prices, but it was unclear which costs had or had not been adjusted.

Source of effectiveness data
The effectiveness data were derived from a non-systematic review of published studies.

Modelling
Age-, gender- and race-specific mortality data were used to create life tables for cohorts of 50-year old renal transplant recipients and the general population. Published models were populated with the cost data and screening effectiveness data from the original publications, data from the newly constructed life tables, and relative risk data from reviewed sources. The specific types of models used were not stated, nor was any other information on the model provided. The models were used to calculate the cost-effectiveness of the different cancer screening programmes for the renal transplant recipients and for the general population.

Outcomes assessed in the review
Effectiveness parameters were derived for the models for:
the incidence of breast, colorectal and prostate cancer;
mammograms in the detection of breast cancer;
an annual digital rectal examination and prostate specific antigen assay in the detection of prostate cancer;
annual faecal occult blood tests and 5-yearly sigmoidoscopy in the detection of colorectal cancer.

The screening effectiveness data from the original model publication were used.

**Study designs and other criteria for inclusion in the review**
The paper gave no details of the design of the primary studies included in the review. No inclusion or exclusion criteria were specified.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
The studies that provided the effectiveness data for breast and colorectal cancer screening were selected because they were representative of those included in the US Preventative Health systematic reviews. The paper did not state how the studies from which the effectiveness data for prostate cancer screening were selected. No details were given about the process of extracting data from the studies.

**Number of primary studies included**
The study included one primary study on breast cancer screening, four on prostate cancer screening and one on colorectal cancer screening.

**Methods of combining primary studies**
A synthesis was not necessary for studies of breast cancer screening and colorectal cancer screening because the effectiveness data for each were taken from a single study. The paper did not give details of how the data from the four studies of prostate cancer screening were combined.

**Investigation of differences between primary studies**
The paper did report how the differing results of the studies relating to prostate cancer were examined.

**Results of the review**
The paper only reported the screening effectiveness data for the three different screening strategies modelled.

For screening for breast cancer, the percentage of positive screens was 3% and the screening efficacy was a 27% mortality reduction.

For annual digital rectal screening for prostate cancer, the percentage of positive screens was 5% and the screening efficacy was a 50% cancer mortality reduction.

For annual faecal occult blood and sigmoidoscopy for colorectal cancer, the false positive screens were 3% and the true
positive screen (polyps) were 60% of cancer incidence.

The screening efficacy was reported as 60% incidence reduction (no prior screen) and a 45% reduction (prior screen). No other data were reported.

**Methods used to derive estimates of effectiveness**
The authors made some assumptions to augment the data used.

**Estimates of effectiveness and key assumptions**
The authors assumed that screening had an immediate effect on reducing cancer. They also assumed a higher rate of cancer incidence in the renal transplant population in comparison with the general population.

**Measure of benefits used in the economic analysis**
The primary outcome measure used in the economic analysis was the number of life-years saved (LYS). The study also reported the numbers needed to screen to save one life.

**Direct costs**
The costs of the screening programmes were taken from the primary studies. The paper reported the annual cost of a mammogram every 18 months to detect breast cancer, an annual digital rectal examination and prostate specific antigen assay to detect prostate cancer, and an annual faecal occult blood test and 5-yearly sigmoidoscopy to detect colorectal cancer. The cost and the quantities of the components of these costs were not reported in the paper. The cost of working up positive results was also reported. It would appear that the costs for breast cancer screening were from 1995, the costs for prostate cancer screening from 1992, and the costs for colorectal screening from 1998. The costs for breast and colorectal screening were discounted at a rate of 3%. The costs for prostate cancer were discounted at 5%.

**Statistical analysis of costs**
The costs were treated in a deterministic manner.

**Indirect Costs**
No indirect costs were included in this study.

**Currency**
US dollars ($).

**Sensitivity analysis**
A one-way sensitivity analysis was undertaken to explore the impact of varying parameters. The relative incidence of the three cancers among renal transplant recipients in comparison with the general population was varied. The discount rate used was also varied, using one higher and one lower rate. A sensitivity analysis was also undertaken on the costs and efficacy of the screening interventions.

**Estimated benefits used in the economic analysis**
In the general population, breast cancer screening saved a total of 13.9 days, prostate cancer saved 8.1 days, and colorectal screening saved 29 days. The authors also reported the numbers needed to screen to save one life and the threshold relative risk for the transplant cohorts.

The numbers of days of life saved for renal transplant patients were not stated precisely in the paper, but were reported
The graphical results were presented for both black and white populations who were also split into subgroups of diabetic transplant patients, non-diabetic transplant patients and all end-stage renal disease patients.

**Cost results**

A mammogram every 18 months cost $79.5 per year, an annual digital rectal examination and prostate specific antigen assay cost $52 per year, an annual faecal occult blood test cost $35 per year, and sigmoidoscopy cost $256 every 5 years. These costs were taken directly from the original studies included in the review.

**Synthesis of costs and benefits**

The costs and benefits were combined in a cost-effectiveness ratio.

In the general population, the cost-effectiveness was $32,194 per LYS for breast cancer screening, $56,850 per LYS for prostate cancer screening, and $25,189 per LYS for colorectal cancer screening.

The cost-effectiveness for renal transplant patients was not stated precisely in the paper, but was reported graphically. The results were presented for the same sub-groups outlined in the 'Estimates of Benefit' section. No confidence intervals were reported. The sensitivity analyses conducted had very little or no impact on the results obtained, and would not alter the conclusions of the study.

**Authors' conclusions**

Screening for breast, prostate and colorectal cancer among renal transplant recipients was less effective, and thus less cost-effective, than in the general population.

**CRD COMMENTARY - Selection of comparators**

The paper used the general population as a comparator. This is a reasonable approach. However, the authors argued that, due to the decreased life expectancy of patients with renal disease, a more appropriate comparator group might have been a cohort of elderly patients.

**Validity of estimate of measure of effectiveness**

The authors did not carry out a systematic review of published studies to gather the effectiveness data. Nor do they appear to have specified specific inclusion and exclusion criteria for the primary studies. The estimates of screening effectiveness were taken directly from four published studies, which appear to have been modelling studies. It is therefore not possible to judge the validity of these estimates. As the characteristics of the primary studies were not reported, it is not possible to assess the quality of the data that were derived from the

**Validity of estimate of measure of benefit**

The measure of benefit used was LYS, which was derived through modelling. The time horizon of each primary model was not reported and it is likely that they were all different. No details of the models used in this paper were reported. The majority of the results obtained were reported graphically in the paper.

**Validity of estimate of costs**

Only the total costs per year of the various screening strategies were reported. These had been taken directly from the primary modelling studies. The perspective of the original model was used, but this was not explicitly reported in the paper. Each strategy appears to have had a different price year and discount rate. It would have been more helpful had the authors converted all the costs to a common year and applied the same discount rate. However, this would have meant that the authors could not have made comparisons with the results of the original studies.
Other issues
The authors compared the results for the general population produced by their model with those obtained form the primary model. No other comparisons were possible, as no other comparable studies had been published. A sensitivity analysis was conducted, which should enhance the generalisability to other settings. However, the quality of the effectiveness data limits the usefulness of the results obtained. In addition, the failure to report any of the modelling details limits the reproducibility, and hence the value, of the results obtained.

Implications of the study
The authors advocated an individualised approach to the screening for specific cancers among renal transplant recipients. They also called for further work to be undertaken on screening in this patient population.

Source of funding
None stated.

Bibliographic details

Other publications of related interest


Indexing Status
Subject indexing assigned by NLM

MeSH
Colorectal Neoplasms /diagnosis; Computer Simulation; Cost-Benefit Analysis; Female; Guidelines as Topic; Humans; Kidney Transplantation /adverse effects /standards; Male; Mass Screening /economics /methods; Prostatic Neoplasms /diagnosis; Time Factors

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