Comparison of costs and complications of radical and partial nephrectomy for treatment of localized renal cell carcinoma


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
Two surgical approaches for the treatment of renal cell carcinoma (RCC) were examined. Radical nephrectomy (RN) represented the routine intervention. Partial nephrectomy (PN) reflected a newer approach within nephron-sparing surgery, which was intended to preserve renal function, when possible.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients selected for RN or PN according to the AJCC TNM classification. The inclusion criteria were single renal tumour less than 7 cm in size, pathologic stage T3a or less, and no concomitant abdominal procedure. Patients were excluded if they presented with a history of abdominal surgery or radiation therapy, and multifocal, bilateral, hereditary or metastatic disease.

Setting
The setting was a hospital. The economic study was carried out at the Wayne State University and the Karmanos Cancer University at Detroit (MI), USA.

Dates to which data relate
The effectiveness and resource use data were gathered from January 1991 to December 1997. No price year was reported.

Source of effectiveness data
The effectiveness evidence was derived from a single study.

Link between effectiveness and cost data
The costing was undertaken retrospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
Power calculations to determine the sample size were not reported. The patients were selected on the basis of the status of the contralateral kidney and surgeon preference, which determined the surgical approach. A sample of 60 patients who underwent PN was matched with an equal sample of patients who underwent RN. The matching was carried out in
terms of age, gender, location and size of the tumour, and pathologic stage. The mean age in the PN group was 62 years
(range: 40 - 76) and the mean tumour size was 3.8 (+/− 2.46) cm. The tumour was on the left side in 28 cases. The
tumour was grade II in 51% of the patients, grade I in 23%, grade III in 21%, and grade IV in 3.3%. The mean age in
the RN group was 65 years (range: 46 - 81) and the mean tumour size was 4.2 (+/− 1.9) cm. The tumour was on the left
side in 31 cases. The tumour was grade II in 56.6% of the patients, grade I in 6.6%, grade III in 31.6%, and grade IV in
5%. The two groups were further subdivided into three groups according to time intervals (1991 to 1992, 1993 to 1994,
and 1995 to 1997), to evaluate the trend in surgical outcome over the study period (longitudinal analysis).

Study design
This was a retrospective, case-matched study carried out in two centres (the Wayne State University and the Karmanos
Cancer University at Detroit). The length of follow-up and loss to follow-up were not reported.

Analysis of effectiveness
It seems that all patients included in the study were accounted for in the effectiveness analysis. The primary health
outcomes assessed in the effectiveness analysis were surgical data, such as operating room (OR) time, estimated blood
loss (EBL), blood transfusion, length of hospital stay (LOS) and complications. In the longitudinal analysis, the OR
time, EBL and LOS were estimated for each of the three periods considered. The study groups were shown to be
comparable in terms of age and tumour characteristics.

Effectiveness results
The OR time was 220.1 (+/− 59.6) minutes in the PN group and 176.6 (+/− 51.6) minutes in the RN group, (p=0.0001).
The EBL was 415.2 (+/− 273.5) mL in the PN group and 506.9 (+/− 443.4) mL in the RN group, (p=0.77).
Blood transfusion was 812.5 (+/− 245.6) mL in the PN group and 650 (+/− 187.6) mL in the RN group, (p=0.64).
The LOS was 6.4 (+/− 3) days in the PN group and 6.4 (+/− 3.3) days in the RN group, (p=0.96).
There were 6 (10%) complications in the PN group and 2 (3.3%) in the RN group, (p=0.2).

In terms of the longitudinal analysis, in the period 1991 to 1992 (14 patients in each group),
the OR time was 225 (+/− 91.3) minutes in the PN group and 211 (+/− 25.4) minutes in the RN group, (p=0.58);
the EBL was 367.9 (+/− 176) mL in the PN group and 403.6 (+/− 153.5) mL in the RN group, (p=0.57); and
the LOS was 6.29 (+/− 2.4) days in the PN group and 6.1 (+/− 0.4) days in the RN group, (p=0.75).
In the period 1993 to 1994 (24 patients in each group),
the OR time was 216.9 (+/− 39.6) minutes in the PN group and 195 (+/− 30.1) minutes in the RN group, (p=0.037);
the EBL was 466.7 (+/− 384.7) mL in the PN group and 363.8 (+/− 144.8) mL in the RN group, (p=0.22); and
the LOS was 5.9 (+/− 2.2) days in the PN group and 5.5 (+/− 1.4) days in the RN group, (p=0.5).
In the period 1995 to 1997 (22 patients in each group),
the OR time was 224 minutes in the PN group and 176 minutes in the RN group, (p=0.004);
the EBL was 446.6 (+/− 305.7) mL in the PN group and 579.6 (+/− 436.6) mL in the RN group, (p=0.24); and
the LOS was 6.4 (+/− 2.3) days in the PN group and 4.9 (+/− 0.7) days in the RN group, (p=0.1).
Clinical conclusions
The only statistical difference between the two treatments was the OR time, which was lower in the RN group than in the PN group. This decrease was accentuated over time.

Measure of benefits used in the economic analysis
The health outcomes were left disaggregated and no summary benefit measure was used. A cost-consequences analysis was therefore carried out.

Direct costs
Discounting was not reported and its relevance was unclear, as the length of follow-up of each patient was not reported. The unit costs and the quantities of resources were not reported separately. The health service costs included in the analysis were grouped into variable costs and fixed costs, which were directly proportional to the volume or occupation of the hospital. The variable costs were for room and board, laboratory, electrocardiography, OR time, radiology, occupational and physical therapy, medications, pharmacy, and nursing. The fixed costs included utilities, overheads, charges for information systems and automation, malpractice and other insurance, medical record maintenance, and transportation. Professional fees for resident, physician assistants, nursing personnel and intravenous technicians formed part of the fixed costs. Professional fees for attending physicians were charged directly from the practice and were thus excluded. The cost/resource boundary adopted was not stated. The costs and quantities were estimated using actual data derived from the hospital records referring to the period 1991 to 1997. No price year was reported.

Statistical analysis of costs
Statistical analyses of the costs were carried out to test the statistical significance of the results.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).

Sensitivity analysis
No sensitivity analyses were performed.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
In the period 1991 to 1992, the total costs were $19,164.1 (+/- 962.5) in the PN group and $20,468.2 (+/- 1,978.1) in the RN group, (p=0.55).

In the period 1993 to 1994, the total costs were $18,743.4 (+/- 1,211.6) in the PN group and $18,877.8 (+/- 1,090.9) in the RN group, (p=0.9).

In the period 1995 to 1997, the total costs were $20,819 (+/- 6,750) in the PN group and $19,759 (+/- 20,183.3) in the RN group, (p=0.81).

Synthesis of costs and benefits
Irrelevant since a cost-consequences analysis was carried out.

**Authors' conclusions**
Partial nephrectomy (PN) and radical nephrectomy (RN) were similar in terms of the complications and overall costs. A statistically significant reduction in operating room time was observed only in the RN group in comparison with the PN group.

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of the comparators was clear. RN was the routine intervention for treatment of patients with RCC, while PN represented a more recent approach to the disease. You should assess whether they represent widely used interventions in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis of effectiveness used a retrospective case-control study in which the study groups were matched, and were thus comparable at baseline. However, the main limitation of the analysis was the lack of randomisation. This could have resulted in the introduction of confounding or selection bias, especially since the surgeon determined the patient allocation to the study groups. Moreover, power calculations were not performed and there was no evidence that the initial study sample was adequate for the study question. The length of follow-up was not reported.

**Validity of estimate of measure of benefit**
The health outcomes were left disaggregated as a cost-minimisation analysis was carried out. The use of a summary benefit measure reflecting quality of life issues would have been useful.

**Validity of estimate of costs**
The perspective adopted in the study was not stated, although it appears that costs relevant to the hospital were included in the analysis. Indeed, charges rather than true costs were used as estimates in the economic analysis. No price year was reported and this could make reflation exercises to other settings difficult. The unit costs and quantities of resources were not reported. Discounting was not performed, but its relevance could not be judged as the length of follow-up was not reported. The time horizon of the analysis was 7 years, but it was unclear for how long each patient was followed. It was also unclear how the costs in 1991 and 1997 were compared without performing any inflation process to take into account changes in the average prices. The follow-up costs were not assessed, although the impact of this omission on the estimated overall costs should not be substantial, as follow-up care was supposed to be similar in the study groups.

**Other issues**
The authors compared their findings with those from other studies. However, the issue of the generalisability of the study results to other settings was not addressed, and sensitivity analyses were not performed. Consequently, the external validity of the analysis may have been somewhat reduced. The study enrolled patients eligible for PN or RN, and this was reflected in the conclusions of the analysis. The conclusions should be limited to the selected population of patients included in this study. The authors noted that a possible shortcoming of their analysis was the exclusion of the follow-up costs from the economic analysis.

**Implications of the study**
The authors suggested that “RN and PN can be performed with similar hospital costs and complication rates and that increasing experience did not have an impact on the hospital costs”. However, this conclusion must be viewed in the light of the limitations of the analysis highlighted. The authors highlight the need for further studies, which should investigate the impact of pre- and post-operative management on the overall costs of PN or RN.
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