Renal colic: a prospective evaluation of non-enhanced spiral CT versus intravenous pyelography

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 use of non-enhanced spiral computed tomography (NECT) for patients with suspected acute renal colic.

Type of intervention
Diagnosis.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised patients with clinically suspected acute renal colic, based (in the majority of cases) on typical pain and haematuria.

Setting
The clinical setting was a hospital emergency department. The economic study was performed at the Emergency Department of the Royal Perth Hospital, Perth, Australia.

Dates to which data relate
The effectiveness evidence and resource use data were gathered between November 1998 and December 1999. It is likely that some data were also obtained after December 1999 (during the patient follow-up), but a final date for the study was not explicitly specified. The price year was not reported.

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

Link between effectiveness and cost data
The costing was performed retrospectively on the same sample of patients as that used in the effectiveness study.

Study sample
It is likely that no power calculations were performed. A sample of 207 patients with suspected acute renal colic admitted to the emergency department was considered for the study. Of these, 106 patients were randomised to NECT and 101 patients to IVP. Seven patients (4 in the NECT group and 3 in the IVP group) were subsequently excluded because of other imaging in the 24 hours prior to randomisation, recent ureteric stone removal and loss of film data. The final sample included 200 patients, 102 in the NECT group and 98 in the IVP group. The mean age of the patients included in the study was 45 years (range: 17 - 86).
### Study design
The study was a randomised controlled trial that was performed in a single centre. An independent party contacted by the attending clinician randomised patients, admitted in normal working hours, to one of the two groups. Out of normal working hours, the attending clinician randomised admitted patients by drawing a sealed envelope. The patients were followed up to a possible end point such as a documented or patient-reported passage of calculus, urological intervention, or alternative diagnosis performed. Patients who did not report any end point were contacted personally at a minimum of 4 months after acute admission. Twenty-seven patients were lost to follow-up, 15 in the NECT group and 12 in the IVP group.

### Analysis of effectiveness
The effectiveness analysis was performed on all patients included in the study for the initial outcomes. Only patients with follow-up data were considered for longer-term outcomes. The primary health outcomes used in the analysis were:

- Diagnostic utility (ability to make a definitive diagnosis),
- The incidence of an alternative diagnosis,
- The urological intervention rates,
- The requirement for other imaging,
- The length of stay, and
- Radiation dosage.

The two groups were not significantly different in terms of their age or gender, but no other details of the groups’ characteristics were given.

### Effectiveness results
A statistically significantly higher number of patients received a definitive diagnosis of ureteric calculi with NECT (65 out of 102) than with IVP (42 out of 98), (p=0.003). Also, a higher number of NECT examinations (11 versus 8) showed evidence of the recent passage of a stone.

The diagnosis was normal in 32 patients with IVP and 21 patients with NECT, (p=0.054).

Alternative diagnoses for the cause of symptoms were made in 4 patients (2 in each group).

The imaging diagnosis was classified as uncertain in a statistically significantly higher number of patients with IVP (14 out of 98) than with NECT (3 out of 102), (p=0.005), showing the higher diagnostic utility of NECT.

Patients in the NECT group underwent more plain abdominal X-rays during hospital admissions than those in the IVP group, 10 versus 0, (p=0.002).

There was no statistically significant difference in the hospital length of stay between the two groups. Also, there was no significant difference in the intervention rate for ureteric calculi (13% for NECT and 15% for IVP).

During the follow-up period, 2 false-negative patients were found in the IVP group versus no patients in the NECT group. Significantly more patients in the NECT group received IVP examinations during the follow-up, (p=0.005).

The effective radiation dose was higher for NECT (5 mSv) than for IVP (2.97 mSv).

### Clinical conclusions
The authors concluded that NECT showed a higher diagnostic utility, but there was no significant difference in patient outcomes during the follow-up.

**Measure of benefits used in the economic analysis**
No summary benefit measure was used. A cost-consequences analysis was therefore carried out.

**Direct costs**
Discounting was not performed since it was not relevant. The quantities of resource use and the unit costs were not reported separately (unit costs were not reported). The quantity/cost boundary adopted was that of the hospital. The costs included in the analysis were for consumables, personnel, maintenance and depreciation for NECT and IVP, and alternative imaging during initial admission and follow-up. The resources used were derived from the patients' case notes. The source of the unit costs was not given. The quantities of resource use were gathered between November 1998 and December 1999, and during a non-specific follow-up period. The price year was not reported.

**Statistical analysis of costs**
No statistical analysis of the costs was performed.

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

**Currency**
Australian dollars (Aus$).

**Sensitivity analysis**
Sensitivity analyses were not carried out.

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

**Cost results**
The average cost per examination with NECT was Aus$15.46 higher than the average cost of IVP.

When the costs of additional imaging during hospitalisation and during the follow-up were also considered, the excess cost of performing NECT in comparison with IVP was Aus$25.64.

**Synthesis of costs and benefits**
Not relevant as a cost-consequences analysis was performed.

**Authors' conclusions**
Non-enhanced spiral computed tomography (NECT) provided a higher diagnostic utility at a relatively low incremental cost. However, given that no difference was found between the two diagnostic imaging techniques in terms of patient outcomes and the ability to diagnose alternative causes for symptoms, it is uncertain whether the extra radiation dosage is justified.
CRD COMMENTARY - Selection of comparators
The rationale for the choice of the comparator was clear. The authors compared two diagnostic tests used as first-line investigation in suspected renal colic in the Australian health system. You should decide whether they are valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness analysis used a randomised controlled trial, which increases the internal validity of the study. However, few details of the patients' characteristics were given. Appropriate statistical analyses were performed to estimate the significance of the difference in effectiveness results between the two groups. Details of the patients excluded, including the reasons for their exclusion, were provided. The study sample appears to have been representative of the study population. The main limitation to the internal validity of the analysis was the lack of power calculations. Further, there was no evidence that the initial study sample was appropriate for the study question.

Validity of estimate of measure of benefit
No summary benefit measure was used in the economic analysis. The analysis was therefore categorised as a cost-consequences study.

Validity of estimate of costs
The authors included the categories of costs that were appropriate to the study perspective. The hospitalisation costs were not included because the difference in length of stay between the two groups was not statistically significant. However, only the final cost results were reported and no information was given on the unit costs and their source. Moreover, no sensitivity or statistical analyses were carried out. The costs were specific to the study setting. The price year was not reported, thus making reflation exercises in other settings difficult.

Other issues
The authors compared the results of their analysis with other published studies performed in similar contexts. In particular, they underlined the difference in their results in terms of the ability of NECT to diagnose alternative causes for patient symptoms. This was 2% in their study and 6 to 13% in the literature. However, the issue of the generalisability of the results was not addressed given the lack of information on the unit costs and sensitivity analyses. Thus, the replication of the study in other settings seems difficult. The authors emphasised that their study was one of the few randomised controlled trials comparing NECT and IVP. They also stated that NECT might have over-diagnosed calculus disease, although no patient in the NECT group subsequently presented evidence of an alternative diagnosis.

Implications of the study
If the radiation dosage of NECT is equivalent or similar to that of IVP, computed tomography should be considered as the best investigation for patients with suspected acute renal colic. NECT should be limited to "patients in whom the symptoms are not classical for ureteric colic, to patients in an older age group, ... and to patients with a contraindication to the administration of intravenous contrast media".

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